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The AIRCRAFT ENGINEER AND AIRSHIPS

First Aeronautical Weekly in the World. Founded January, 1909

Founder and Editor: STANLEY SPOONER

A Journal devoted to the Interests, Practice and Progress of Aerial Locomotion and Transport

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DIARY OF CURRENT AND FORTHCOMING EVENTS

Club Secretaries and others desirous of announcing the dates of important fixtures are invited to send particulars for inclusion in this list:—

1933.

Jan. 26. "Human Limits in Flying," Lecture by Wing-Com. G. S. Marshall before R.Ae.S.
Jan. 26-28. Forest Gate Aviation Show.
Jan. 31. "Detonation," Lecture by F. R. B. King before R.Ae.S., Students' Section. Chairman, H. T. Tizard.
Feb. 1. Entries close for the Deutsche de la Meurthe Cup (Aero Club de France).
Feb. 2. "Operation of Aircraft Over Tropical Routes," Lecture by A. Plesman before R.Ae.S.
Feb. 3. Cinque Ports Flying Club Annual Dinner and Dance Royal Pavilion Hotel, Folkestone.
Feb. 8. "Recent Operations in Kurdistan," Lecture by Group-Capt. A. G. R. Garrod before R.U.S.I.
Feb. 8. Herts and Essex Ae.C. Annual Dinner and Dance, Wharncliffe Rooms, Hotel Gt. Central, London.
Feb. 10. Old Halleyburian R.F.C. Annual Dance, Savoy Hotel.
Feb. 10. Viceroy's Challenge Trophy Race, Delhi.
Feb. 13. "A Review of Air Transport," Lecture by G. E. Woods Humphery before Inst. of Transport.
Feb. 16. "Cloud Formation," Lecture by Sir Gilbert Walker before R.Ae.S.
Feb. 18. Services Rugby: R.A.F. v. R.N., Twickenham 3 p.m.
Mar. 3. No. 25 (F.) Sqd., R.A.F., Re-union Dinner at May Fair Hotel. (Postponed from Jan. 6.)
Mar. 4. Services Rugby: R.N. v. The Army, Twickenham 3 p.m.
Mar. 9. "Engine Cooling Research." Lecture by R. McKinnon Wood before R.Ae.S.
Mar. 23. "Seaplane Research," Lecture by H. M. Garner before R.Ae.S.
Mar. 24. Bristol and Wessex Ae.C. Dance at Grand Spa Hotel.
Mar. 25. Services Rugby: R.A.F. v. The Army, Twickenham 3 p.m.
Mar. 29. "The East African Dependencies." Lecture by H. F. Melland before R.U.S.I. Chairman, Air Vice-Marshal Sir V. Vyvyan.
June 24. Royal Air Force Display, Hendon.

EDITORIAL COMMENT

EVERYONE is extremely relieved and delighted at the news that Lady Bailey has been found alive and well in the Sahara by aircraft of the French Flying Corps. Our hope for the survival of that great pilot and most lovable man, Bert Hinkler, must necessarily grow fainter with each passing day. While he and Lady Bailey were both missing, things looked black indeed. Then two of the searchers, Capt. Hope and one of the French pilots, were also reported missing, though in Hope's case there was nothing wrong and the French pilot turned up in due course.

Unwelcome Guests

All British flying people, in fact all British people of all callings, must feel intense gratitude to the French Flying Corps for the efforts they made and the risks which they ran in searching the dread Sahara for Lady Bailey and bringing her back safe and sound. Certainly the air, like the sea, breeds a wonderful spirit of comradeship among those who travel by that element, and seamen and airmen alike count no effort too great to rescue one of their fellows in danger. We are glad to think that our own Royal Air Force has not been backward in rescuing foreign pilots lost in the desert or on the Atlantic. That the unfortunates whom our men have rescued have mostly been Spanish rather than French makes no difference. French pilots in distress could certainly reckon on an equal degree of help from their British comrades. While expressing our gratitude to the French Flying Corps, we should not forget that it was the French infantry which took help to Mr. Victor Smith.

These various rescues raise the question of how far it is legitimate for adventurous pilots to trade on the self-sacrificing generosity of others. We must say that we feel rather ashamed that British aeroplanes should recently have given so much trouble to the French. Searching by air involves risk, as was shown by the adventure of the French pilot who was temporarily lost while hunting for Lady Bailey, and it also costs money. It may be taken for granted that no thoughts of expense would deter a public servant from setting out to save life, any

more than similar considerations would prevent a lifeboat from putting to sea; but expenditure of public or private funds is not a matter to be brushed aside as if of no account. Capt. Hope had to make arrangements for his expenses before setting out to search for Hinkler, and we understand that an anonymous friend made a handsome contribution. Likewise when Government machines make a search public money has to be spent, and at this time no nation wishes to see its public expenditure avoidably swelled. Certainly the cost of a search by air is not so heavy as when shipping has to undertake a search for a seaplane down on the Atlantic, but none the less it is not a matter to disregard.

The French authorities in Africa, who perhaps stand to lose most, now that West Africa has become the speedway for record breakers, have decided to require a deposit of £1,300 before permission is granted to any pilot to fly across the Sahara. Likewise, the Swiss Flying Corps, whose pilots undertook a search for Capt. Hope when he did not return to Lausanne one night, are stated to have sent in a bill for expenses. We think that they were, to a certain extent, justified in doing so, as it appears that it would have been possible for Capt. Hope personally to have got a telephone message through to Lausanne saying that he had landed at Vetroz, instead of entrusting, as reported, the telephoning to a girl of the village, with somewhat unpleasant results. Some pilots would not have the resources to make the necessary deposit now suggested or to meet the subsequent bill. The question is whether pilots who are unable or unwilling to make a deposit in advance have any moral right to undertake a flight over specially difficult and dangerous country, especially if they are not citizens of the nation which rules that country. Of course, the pilots concerned would probably complain that the cost of long-distance flying is high enough already, and that such a stipulation would make it impossible for any except the wealthy to make long flights at all. The reply to that would be that if one has not the money oneself one has no right to make the French or Swiss taxpayers bear the cost. If even a moderate proportion of air tourers are to cause a lot of trouble and expense to the countries over which they fly, they will soon come to be regarded as unwelcome guests.

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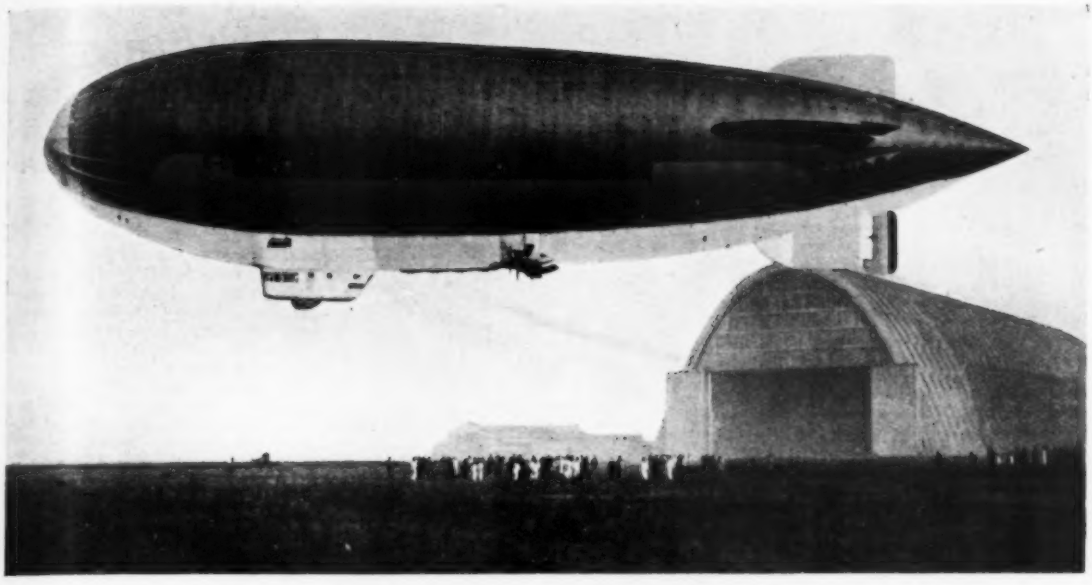
The *Arc-en-Ciel*

The crossing of the South Atlantic by the Couzinet three-engined monoplane *Arc-en-Ciel*, with a party of six on board, was a really fine flying feat, which certainly cannot be placed in the "stunt" class. We hold that a seaplane is preferable to a landplane for a transoceanic flight, but the *Arc-en-Ciel* had plenty of reserve power, and during her flight from Istres down to Senegal she showed her ability to keep in the air on only two engines, when the oil cooler on the central engine developed trouble and put that engine out of action. When one can thus eliminate the possibility of a forced landing, there is the less need to worry about the suitability of one's landing arrangements for coming down on either land or water. We take it that this flight from St. Louis in Senegal to Natal in Brazil was a try-out before starting a regular air service across the South Atlantic by the Aèropostale firm. M. Jean Mermoz, if we mistake not, is the chief pilot of the Aèropostale Company, and this was his second flight of that description across the South Atlantic. The first one was made in May, 1930, in a single-engined Latécoère seaplane. We understand that the Aèropostale Company has always intended to use flying boats when the time came to substitute air transport for the present sea transport across the ocean section of their service. There have been unfortunate delays in getting the right type of flying boat, and so, we suppose, the company decided to make a demonstration flight in this new type of multi-engined landplane. This does not necessarily mean that landplanes will be put into regular service across the Atlantic. Probably this Couzinet type will only be used for the first section down as far as Casablanca, but in a landplane of this design most of the dangers of a long sea crossing disappear.

One very great point about this design is the accessibility of the wing engines during flight. On the way to St. Louis an oil pipe needed attention, and the mechanic, Jousse, crawled along the passage way inside the wing, which is 3 ft. 3 in. thick at the point of junction with the fuselage and 2 ft. 10 in. at the point where the engines are mounted, and effected the necessary repairs.

Special honour is due to the crew and the single passenger on board on this Atlantic flight. The passenger was M. René Couzinet himself, an aircraft constructor who has met with a series of misfortunes, but who has kept going with tenacious courage, and has inspired a devoted staff with a confidence in him as great as his own. Not every head of a constructing firm would venture to cross the Atlantic in one of his own aeroplanes. After the mishap to the first *Arc-en-Ciel*, the fire at his works, and various financial difficulties, M. Couzinet deserves the highest congratulations on this brilliant success. The radio operator, M. Jean Manuel, was the only survivor of the disaster to the first *Arc-en-Ciel*, but his nerve has evidently not been shaken, and his work in sending out a constant stream of messages during the flight, first back to St. Louis and then on to Natal, prevented any anxiety being felt about the safety of the machine. The value of wireless in obtaining bearings during a transoceanic flight cannot be over-estimated. We have mentioned Mermoz and Jousse. It only remains to pay a tribute to the second pilot, Capt. Carretier, and to the highly successful navigator, Capt. Mailloux.



THE FRENCH NAVY'S NEW AIRSHIP : The 10,000-m³ semi-rigid airship E.9, which made its first flight trials on January 10 at Orly.

THE NEW FRENCH NAVAL AIRSHIP

By The Hon. A. F. de MOLEYNS

ON Tuesday, January 10, the E.9 made her first flight at Orly Airship Station. She was commanded by Lt. de Vaisseau Tourtette, and M. Debroutelle, the Zodiac pilot, was also on board, the total carried being 11 persons.

The E.9 is the second of her class, the E.8 having been delivered in September, 1931, while a third, the E.10, is still on the stocks. E stands for Escorteur, and these ships are intended to escort troop ships and other craft across the Mediterranean. They are semi-rigids with external keels, and are sturdily built even if not of any great beauty of line. In the keel are the petrol and water ballast containers and the small blower engine. The control wires also run along the keel, and the four ballonette valves are easily accessible. The envelope contains four ballonettes, and pressure is kept up when in flight by means of airscoops, and when motionless by the blower, the motor of which also works the wireless. The two Hispano Suiza engines, which are each of 350 h.p., are outrigged from the keel, and small platforms allow running repairs to be carried out ; and in the keel between the engines is a control platform from which the motors are worked in answer to signals from the control car. This last is suspended direct from the keel, and in the bow portion are the usual steering and elevating wheels, and the gas, water ballast and engine room controls. Aft are wireless and navigating rooms. The keel itself is suspended from the top ridge of the envelope, the envelope being divided longitudinally by a series of rope and fabric ridges.

The cars of E.9 and E.10 are roomier than that on E.8, and are streamlined and fitted with large windows, from which excellent views can be obtained. On the bow of the ship is a mooring cone, and in the keel is a mooring platform.

When the trials are completed the ship will be flown to Rochfort, which is now the only other French airship station actually in commission, and where there is a mooring mast. The airship school is at Rochfort, and a number of pilots are trained there each year. Officers undergoing a navigation course also make ascents in the airships, for these craft have many obvious advantages over heavier-than-air craft for this work. Free balloon ascents are also made, as they are from Orly when any waste gas is available.

In addition to the E class ships, there is also another type, known as "Vedettes," these taking the place of our SS ships. There are about half a dozen of these ships in existence, but only one or two are usually inflated at a time. One of these, the V.II, has attained a speed of 60 m.p.h., and is thus one of the fastest non-rigids ever built.

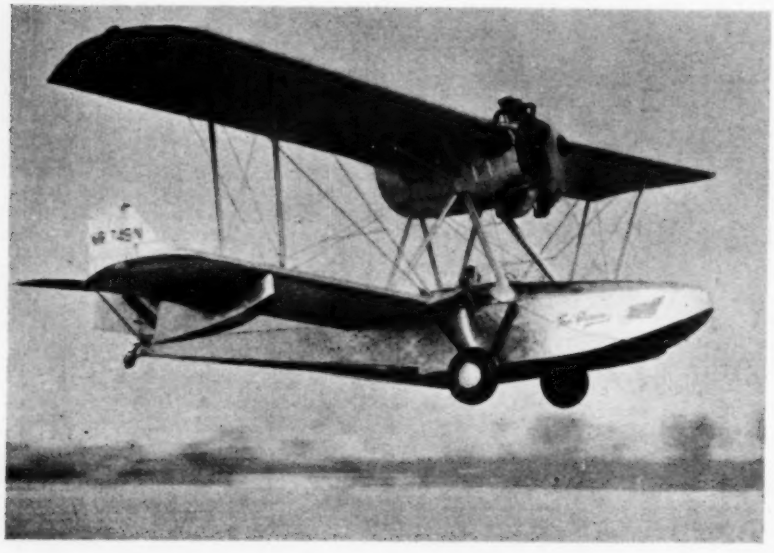
The V.II is an interesting little ship with a trefoil shape envelope and internal rigging. The car is slung directly under the envelope, and she is driven by two outrigged 120-h.p. Salmson engines. She is virtually a successor of the old Astra Torres ships, and an excellent little ship with very nice lines.

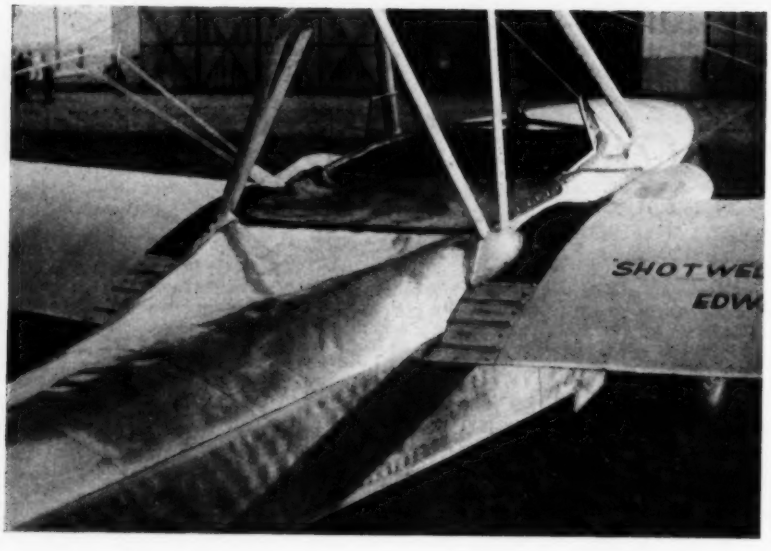
The French Naval Airship Service, therefore, though small, is very much alive and capable of quick expansion.

While the French remember the important work of the airships in the anti-U boat campaign, and so keep at least a skeleton airship service in being, we in this country appear to have forgotten that during the war airships were found to be a vital necessity, and so it is to be hoped that one day our own Airship Service will be revived. May that day come soon.

Particulars of the E.9

Volume	10,000 m.³ (353,148 cu. ft.).
Length	30 m. (98 ft. 5 in.).
Diameter	17 m. (55 ft. 9 in.).
Normal crew	8.
Max. speed	110 km. per hr. (68½ m.p.h.).
Cruising speed	75 km. per hr. (46½ m.p.h.).
Radius of action... ...	1,500 km. (932 miles).





SHOT-WELDED MACHINE ARRIVES

THE American Aeronautical Corporation's BB.1 amphibian "Pioneer," built by the Budd Co. entirely in stainless steel, arrived in England from France on Friday of last week. Piloted by M. Jean Assolant (one of the pilots of *l'Oiseau Canari* on the flight from America to Spain in 1929), the machine cleared Customs at Heston, and then flew across to Hanworth, where its first public demonstrations were given last Saturday by Rex Stocken and Assolant.

Fundamentally the "Pioneer" is a Savoia S.31 amphibian, translated into stainless steel "shot-welded" construction by the American Aeronautical Corporation and the Edward Budd Manufacturing Co. A fairly detailed description of the machine was given in our issue of December 8, 1932, to which we would refer readers. The British rights of the "shot-welding" process are held by the Pressed Steel Co. of Cowley.

When the machine had been washed down at Hanworth, the unpainted stainless steel plating of the hull looked "like new," and had apparently suffered nothing during the quite long period in which the machine has been in service. What surprised one most was the minute size of the welds, which seemed to average less than $\frac{1}{16}$ in. diameter, and were spaced $\frac{1}{4}$ to $\frac{3}{8}$ in. apart. For thicker material welds of larger diameter are used. The internal wing structure could not, of course, be inspected, but if the hull has escaped corrosion and other trouble, it is fair to assume that the wings are in first-class condition.

SHOT-WELDED: A series of views of the "Pioneer." The pilots are M. Jean Assolant and Mr. Rex Stocken. (FLIGHT *Photos.*)

Balanced Controls

The new aileron balance fitted to " Monospar " aircraft gives promise of solving many control problems and may be applicable to elevators and rudders

ADEQUATELY to balance ailerons under all flying conditions has been the aim of designers since the earliest days. The number of devices evolved to attain this end are innumerable, but one and all would appear to have drawbacks, making them unsuitable for use under all and every condition. On thick-wing monoplanes, in particular, many difficulties have been encountered and much has been heard about " reversal of aileron control at high speeds." It is, therefore, of particular interest to find that Mr. H. J. Stieger, the well-known designer of the " Monospar " and Managing Director of the General Aircraft Co., Ltd., has produced a form of balance which has proved to be exceedingly effective both at low and high speeds. In flight, it is evident that any degree of perfection of aileron balance can be obtained. For example, the " Monospar," which has at times been criticised as being somewhat heavy laterally, became beautifully harmonious when these hinged flaps were suitably adjusted. On the particular machine tested, there was an interesting reflection on control harmony which gives a hint of a new field of investigation. Before fitting, this machine had a slight hunting tendency in pitch, most disagreeable for a novice or heavy-handed pilot. The ailerons were too heavy. Balance flaps were fitted so as to lighten the ailerons, whereupon the pitch instability, in effect, disappeared. This is attributed (rightly, we think) to the fact that with heavy and positively centring ailerons and light elevator, the control moved fore-and-aft, as it were, " in a groove." By lightening and balancing the ailerons one " planed away the groove," so removing any undue tendency to fore-and-aft stick movement and also at the same time the impression of supersensitiveness. There seems to be no reason why this neat device should not be applicable generally to aircraft to lighten (or to load) any or all the controls and to provide a required degree of balance, self-centring, or trim. It appears to be admirably adaptable to existing controls, and it is difficult to see how it can go wrong as it only works when the control proper works. The " Monospar " has been dived at over 200 m.p.h. and this balance has, on the ailerons, been found perfectly satisfactory both at that speed and also at the stall.

The following description of the flap shows its essential simplicity.

On cantilever thick wing monoplanes it has been found that the aileron operation is inclined to heaviness at the top speed of the aircraft and to become increasingly heavy when the aircraft is dived at speeds in excess of this figure.

The views show the new balance fitted to the ailerons of a " Monospar." (FLIGHT *Photo.*)

This is specially evident on reflex aerofoil sections of the type used to limit the centre of pressure travel.

The device shown in Fig. 1 is an attempt to provide an automatic aerodynamic balance to promote lightness of control. It consists of an auxiliary flap inset into the aileron at the trailing edge and hinged to the aileron itself. A lever on the auxiliary flap is attached by means of an adjustable strut to a fixed lever arm anchored to the wing proper. The aileron is operated in the normal way and downward movement causes the auxiliary flap to move upwards with respect to the aileron. This relative inclination of auxiliary flap to aileron calls into play a downward force which reduces the hinge moment and lightens the control. A similar relief is experienced when the aileron moves upwards and the flap downwards. There is obviously a reduction in rolling moment, but the relatively small size of the auxiliary flap in comparison with the aileron area makes this reduction unimportant.

Reasonable precautions in design have to be taken with regard to the proportion of the auxiliary flap chord to aileron chord as well as to the provision of a suitable area

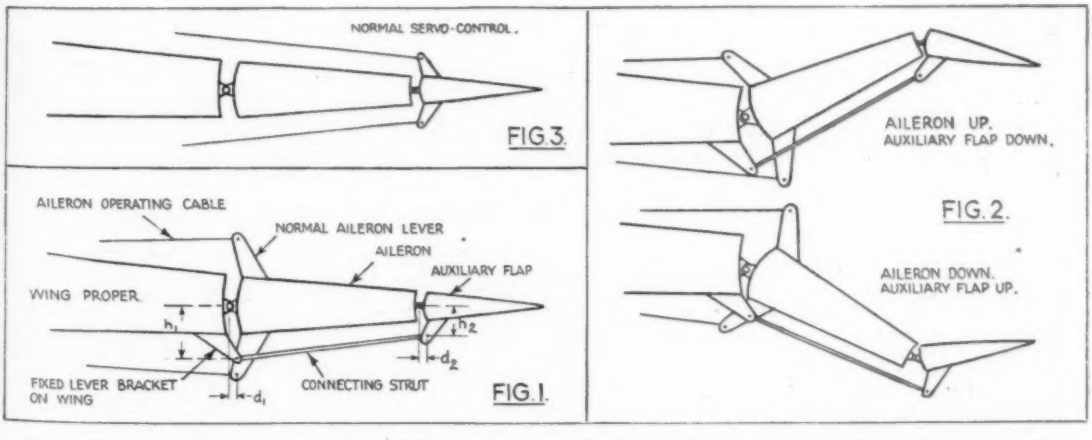


Fig. 1 shows the general layout of the " Monospar " aileron balance, while Fig. 2 shows the two extreme positions for the same balance. Fig. 3 is a diagrammatic representation of the normal type of servo-balance.

of auxiliary balance surface. Also the operating mechanism needs careful consideration to ensure that the aileron and auxiliary flap arrangement is not stalled at the optimum aileron movement. Variations of the dimensions h_1, h_2 and d_1, d_2 (Fig. 1) produce widely divergent results, and they must be co-ordinated so that the auxiliary flap does not "take charge," but still leaves a certain degree of "feel" of the control to the pilot. It follows that any degree of harmony between aileron and elevator control can be achieved.

There is another advantage to this device in that it provides a simple and convenient correction to slight inequalities of wing incidence which are bound to occur in manufacture. The tendency to fly "wing low," especially at the higher speeds, can ordinarily be corrected by small deflector plates attached to the trailing edge of the aileron (used on Schneider racing aircraft on all control surfaces). A screw adjustment incorporated in the connecting strut provides for this.

The ordinary servo-control arrangement (Fig. 3) adapted to ailerons has on occasion been found unsatisfactory. The drawback is that the mechanism is *unstable*—oscillations about the mean position occur, since the main body of the aileron is at the mercy of the auxiliary surface. With the mechanism here described the auxiliary surface movement is dependent upon the aileron movement, and is rigidly held in position at any given aileron angle. It therefore has the advantage of being *completely stable* in operation, and with a conservative arrangement of leverages the force required to endow it with "servo" properties cannot be attained in any condition of flight.

It owes its inception to the fact that it was devised to demonstrate that reversal of aileron control did not occur on wings of "Monospar" construction at high speeds. The tendency to aileron heaviness under these conditions made it desirable to render the ailerons easily operable without, however, making the control too light at the stall.

THE SEARCH FOR BERT HINKLER

CAPT. W. L. HOPE has returned to England after spending several days in a vain search for Bert Hinkler in the Bernese Oberland. From Basel Capt. Hope moved to Lausanne, and from there, accompanied by a friend, Mr. Heanly, he made several flights along the valley of the Rhone in the direction of the Wetterhorn. Incidentally, though Mr. Heanly is connected with the *Daily Mirror*, Capt. Hope states emphatically that he only accompanied him as a friend, and that no newspaper was associated with the search. Capt. Hope had offered to stand half the cost of the search itself, and the rest was raised privately, one anonymous friend making a very handsome contribution. While making his search Capt. Hope found the weather very unfavourable and treacherous, and he says that it was only when he arrived in the Alps that he realised the magnitude of the task of searching for one small monoplane in that vast region of snowy mountains. Capt. Hope was also handicapped in his inquiries by his ignorance of the language, and he admits that on one occasion he did not realise that he had been invited to dinner, and consequently did not attend. With regard to the rumour that he was missing one night, what happened was that a Swiss pilot showed him a landing ground at Vetroz, near Sion, on the Rhone, and the next day he landed there and decided to stay the night. He sent a girl to telephone to Lausanne to report his intentions, but the message was not received, and next day some aeroplanes of the Swiss Flying Corps and also some from the Swiss Aero Club went out to look for him. He was presented with a bill for the cost of these flights, and settled it. So far from being exhausted when he landed at Vetroz, he climbed some thousands of feet up a mountain that same afternoon.

On one of his flights Capt. Hope was forced down by his carburetter freezing, and the idea occurred to him that the same trouble might easily have befallen Hinkler. The most definite information which he collected about Hinkler was that a climber in the Diablerets region on January 7, the day of Hinkler's start, when at a height of 9,000 feet, saw a monoplane about 500 feet above him, and Capt. Hope was satisfied that this must have been Hinkler's "Puss Moth." Asked if he could definitely rule out the possibility of Hinkler having found refuge in a hut in the mountains, where it would take a long time to get into communication with civilisation, Capt. Hope admitted that owing to his ignorance of the language he had not been able to collect much information about local conditions on the Alps. He knew that nine feet of snow had fallen in the district since the date of Hinkler's start, and that the people said that no one could survive high up on the mountains in such weather without proper comforts. If the "Puss Moth" had crashed, it would be difficult in any case to spot it from the air in such a vast region of snow and rocks, but the heavy fall of snow since the day of the flight would certainly have hidden it from view. For the moment it appears that nothing more can be done.

CAPT. HOPE IN SWITZERLAND: W. L. Hope (centre) is seen with Maj. Koepe (left), Director of Basel Aerodrome, and Mr. Heanly (right) at Basel on January 16.

Mercenary Fighting Aeroplanes

IT is reported that the Maharaja of Alwar is considering the hire of two aeroplanes to fly over rebel country and "create a moral effect." The Maharaja is said to have declared that he intends to "fight the rebels to a finish," as he feels it his duty to either rule or abdicate. Incidentally, how does a ruler "fight rebels to a finish" by "creating a moral effect"?

Another Ottawa Conference

ON January 5 an important conference took place at Ottawa between Post Office, aviation and other officials; it resembled other Ottawa conferences in that the schemes put forward were very much in the air. The question of expansion in the air service between Rimouski, Quebec and Montreal was discussed. The new routes suggested would be between Montreal and Belle Isle via Moncton, New Brunswick and Newfoundland during the summer, and between Montreal and Halifax during the winter.

The Master of Sempill

COL. THE MASTER OF SEMPILL has returned from Paris, where he attended the meeting of the International Commission for the study of motorless flight, and the extraordinary conference of the Fédération Aéronautique Internationale.

The Mark II Atlas Armstrong Whitworth Aircraft fitted with the 640 h.p. Tiger engine.

The 640 h.p. Tiger

722 h.p. at maximum r.p.m.

THIS new Armstrong Siddeley engine has been developed from the famous Lynx-Jaguar-Panther series and embraces the most advanced practice in aircooled engine design.

It fulfills a wide range of Service and Civil requirements and with a reduction gear is available in medium or fully supercharged form.

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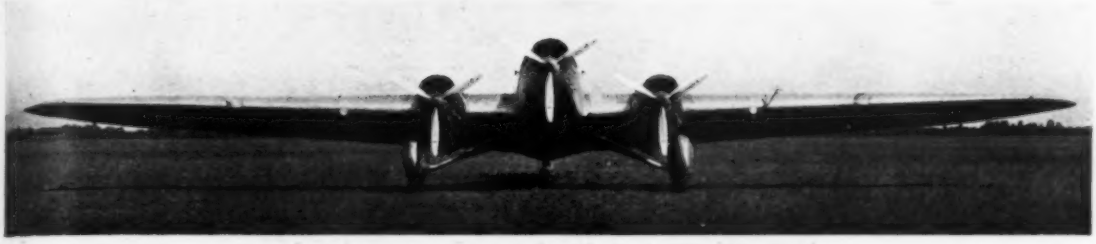
OVER THE HIMALAYAS.—A Hawker Hart two-seat Day Bomber biplane (Rolls-Royce Kestrel I.B. unsupercharged engine) flying among the higher peaks of the Himalayas on service duties connected with the defence of the North-West Frontier.—(*R.A.F. Official photograph.*)

(Advt.)

Air Transport



Front view of the Couzinet *Arc-en-Ciel* 3-engined monoplane.

THE SOUTH ATLANTIC AIR MAIL

THAT the time taken to transport the mail over the 8,500-mile postal air route between France and Buenos Aires can be reduced to half by effecting the crossing of the 2,000 mile stretch of Atlantic Ocean between Dakar (French West Africa) and Natal (Brazil), by fast multimotor land planes equipped with an ample excess of power, would seem to be clearly indicated by the recent flight of the Couzinet *Arc-en-Ciel* three-engined monoplane, already briefly reported in FLIGHT.

The question of this ocean crossing has long been a problem of the Aéropostale Co. The total time occupied to traverse this air route from Marseilles to Buenos Aires has been reduced to an average of between 7 to 8 days. About one hundred hours (4 days), however, are required to make this Atlantic crossing, which is being effected at the present time by fast light steamers. Several new types of seaplanes are being designed which are expected to make this flight in about 18 to 20 hr. (100 m.p.h.). No trial trips, however, of these new machines have as yet been made, and the only aerial crossing from a commercial point of view was made on June 14, 1930, by Jean Mermoz, the chief pilot of the Aéropostale Co., who flew a Latécoère single-engine monoplane, of the type at present in service on their system. This plane was fitted with floats and equipped with a 650 h.p. Hispano-Suiza engine. Mermoz, accompanied by a mechanic and radio operator, made the flight at the speed of 150 k.p.h. (93 m.p.h.). A return flight was not successful, and no further attempts have since been made.

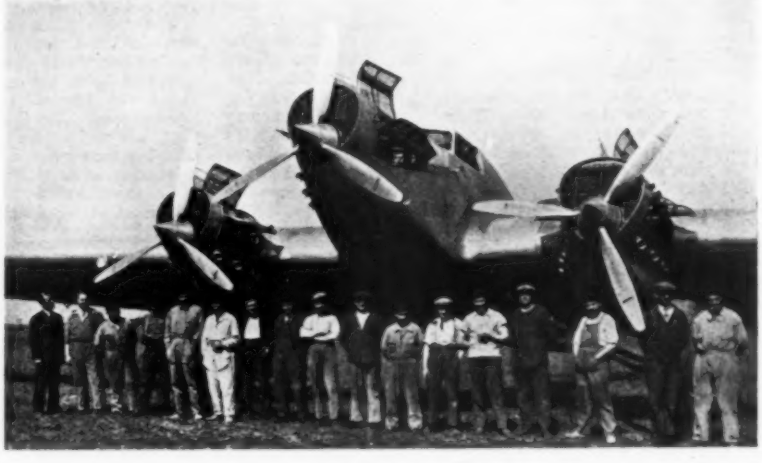
The Flight of the *Arc-en-Ciel*

The *Arc-en-Ciel*, tri-motor Couzinet plane, equipped with three Hispano-Suiza 650 h.p. water-cooled engines (Scintilla magnetos), having six persons aboard, flew across this stretch of ocean on January 16 last in 14 hr. 27 min., at an average speed of 221 k.p.h. (137 m.p.h.), notwithstanding encountering a strong head wind and bad weather a large part of the way. Satisfactory and at times better speed was also shown by this plane on other sections of its flight from Marseilles to Buenos Aires.

Under the auspices of the Aéropostale Co. and piloted by Jean Mermoz, their chief pilot, the *Arc-en-Ciel* took off from the Istres aerodrome (Marseilles) at 10 a.m. on January 12 last. The plane also carried Capt. Pierre Carretier, the chief pilot of the Couzinet Co., who acted as assistant pilot during the flight, Capt. Mailloux the navigator, Rene Couzinet, the constructor of the plane himself, together with a radio operator, Manuel, and two mechanics, Jousse and Mariault, making seven persons aboard. The weight of the machine at the "take off" was 14,500 kg. (14½ tons), which included 8,600 litres (1,892 gallons) of petrol and 250 litres of oil. The total capacity of the fuel tanks, 12,000 litres (2,640 gallons), which furnish a cruising flight radius of 6,800 km. (4,225 miles), were not carried on this flight.

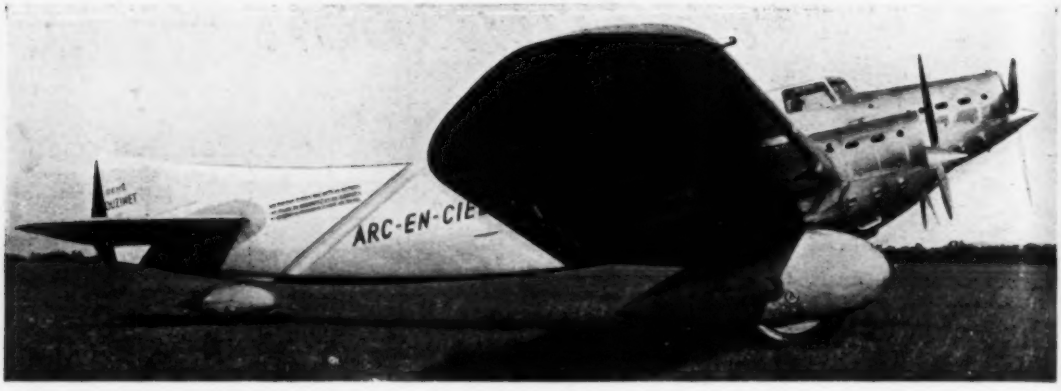
The machine took off easily in 35 sec. with a light cross wind prevailing, and in 15 min. had attained an altitude of 1,000 m. (3,280 ft.). While it had been intended to reach St. Louis de Senegal on the first leg of this flight, a leak in the oil radiator of one of the lateral engines, which appeared as the plane approached the African Coast, made it necessary to cut out this motor for the time being, and it was decided to make a landing at Port Etienne instead, which was done at 2.30 a.m. the following morning, the plane having flown 4,000 km. (2,500 miles) at the rate of 237 k.p.h. (147 m.p.h.). Some 1,900 litres (419 gallons) of petrol and 200 litres (44 gallons) of oil remained in the tanks at the landing, the three Hispano engines consuming some 403 litres (90 gallons approx.) per hr.

The plane took off again from Port Etienne at 11.15 a.m., January 13, and covering the 600 km. (373 miles) distance arrived at St. Louis at 2.20 that afternoon. Continued rainy weather was encountered at this stage of the trip, which made the surface of the airport a quagmire and prevented the *Arc-en-Ciel* from taking off from St. Louis until 3.50 a.m. Monday, January 16, and so begin its flight over the South Atlantic. One of the mechanics was



The three 650 h.p. Hispano-Suiza engines in the Couzinet monoplane.

OVER THE HIMALAYAS.—A Hawker Hart two-seat Day Bomber biplane (Rolls-Royce Kestrel I.B. unsupercharged engine) flying among the higher peaks of the Himalayas on service duties connected with the defence of the North-West Frontier.—(R.A.F. Official photograph.)



Side view of the Couzinet monoplane, in which Mermoz recently flew from Marseilles to Brazil.

left at St. Louis, as was originally agreed, and the plane made the ocean crossing of some 3,200 km. (2,000 miles) with six persons aboard in 14 hr. 27 min. (average speed of 221 km./hr.), landing at the Natal Aerodrome at 7.20 o'clock that evening. When taking off for the Atlantic crossing the machine weighed 14,200 kg. (31,235 lb.) and carried 8,297 litres (1,825 gallons) of petrol and 250 litres (55 gallons) of oil.

Taking off again from Natal at 8.50 a.m., Tuesday, January 17, the 2,300 km. to Rio Janeiro was covered at the rate of 230 k.p.h. (143 m.p.h.), in 9 hr. 55 min., arriving there at 6.45 that evening, where it was given a very enthusiastic reception. Bad weather delayed further progress, but Buenos Aires was reached on January 22.

General Description of the *Arc-en-Ciel*

This Couzinet plane, also known as type 70, is a cantilever, low, thick wing monoplane of wooden construction, designed as a commercial plane with a long flight radius. The wings are tapered with rounded ends, the spars and internal framework being of wood covered with plywood.

The fuselage is of a somewhat rectangular shape forward, which gradually tapers to a very narrow section in the rear. The structure is also of wood covered with plywood.

The central engine is mounted in the extreme nose of the fuselage and in front of the cabin.

The framework supporting each of the two lateral engines is composed of welded steel tubing fastened to the front spars of the wings. The engines are thus accessible in flight for minor repairs, from the interior of the wings. They are covered with duralumin cowlings. Each Hispano engine is equipped with 3-bladed duralumin Chauviere airscrews. The engines are of the 12 Nb type.

The landing gear is of the split axle type, equipped with oleo shock absorbers, which are braced to the underside of the fuselage by steel tube vees. The wheels are mounted in stream-lined casings.

The general characteristics are as follows:—Wing span, 30 m. (98 ft. 5 in.); length, 16,135 m. (53 ft.); height, 4,03 m. (13 ft. 3 in.); wing surface, 90 m.² (968 sq. ft.); weight loaded, 16,790 kg. (36,950 lb.); weight fuel, 8,430 kg. (18,550 lb.); weight equipped with oil, water, rations and radio, 7,130 kg. (15,700 lb.); weight crew, 400 kg. (880 lb.); weight pay load, 600 kg. (1,320 lb.).

R. C. W.

Fokker F.XII for Denmark

THE well-known Danish air transport company, Det Danske Luftfartselskab, which has for many years been very active and has set up a marvellous record for safety and regularity on its lines (which are being operated with Fokker F.VII "Jupiter" machines), has now decided to organise an express service from Copenhagen to Berlin. This important line will be inaugurated early in 1933. Up till now the single-engined machines operated on this line had to make a great detour over Lubeck-Travemunde, for reasons of safety. This year Det Danske Luftfartselskab intends to fly the so-called direct course from Copenhagen to Berlin, a distance of 360 km. (225 miles), of which 141 km. (88 miles) are over water. On this new line Det Danske Luftfartselskab will use a modern 16-seater machine, viz., the Fokker F.XII, equipped with three Bristol "Jupiter" engines, which will give the plane a cruising speed of over 200 km./h. (125 m.p.h.), so that the trip will be made in less than 2 hr. By train and ferry it takes about 12 hr. The Danish Government attaches a high value to building this modern type of aircraft for their own use in Denmark, and the first of the F.XII machines for Det Danske Luftfartselskab will be built in the works of Det Kongelige Danske Orlogsvaerft in Copenhagen. News of the express service Copenhagen-Berlin will certainly be received with great interest by travellers.

Manchester Air Lines

THE Manchester Corporation Airport Committee, at their next meeting, will consider a scheme for the establishment of airlines to various places, including Ireland, but it is not intended to start a direct Continental service at first.

Retrenchment may affect Civil Aviation in India

Among the results of retrenchment in the Meteorological Department of the Government of India in these days of financial stringency are the reduction of the 140-year-old Observatory at Madras (established by the East India Company in 1792) to the status of a pilot balloon station; the abolition of the balloon station at the Imperial capital, Delhi; the reduction of the meteorological office at Rangoon to the status of a pilot balloon station and various other items of retrenchment, including the abolition of four pilot balloon stations sanctioned in connection with the civil and military aviation schemes in India.

The 4,000 miles of internal air route between the Persian Gulf and South Burma are now served by two forecasting centres at Calcutta and Karachi respectively. The result is that the meteorological service is not able to attain the standard recommended by the International Air Convention. The Director General of Observatories hopes that when financial conditions sufficiently improve, the skeleton air service now being maintained will receive consideration so as to increase the safety of regular flying.

On the scientific side of the Department the last year was marked by a fair amount of progress. At Agra and Allahabad about 160 sounding balloon ascents were made, a number of instruments penetrating to heights between 12 and 17 miles. A method of connecting balloons at night with electrically illuminated tails was evolved. At the headquarters at Poona several investigations were made on the meteorological conditions on the *ghats* (range of hills) before and during the monsoon, on upper air conditions in normal and disturbed weather, on solar and sky radiation, Zodiacal lights and the light of the moonlit night sky.

Two buildings have been acquired by the Government of India near the Dum Dum aerodrome, which will be used as a branch meteorological office.

The present work of balloon flying, which is now being done at Alipore Observatory in Calcutta, is shifted to Dum Dum.

The AIRCRAFT ENGINEER

FLIGHT ENGINEERING SECTION

Edited by C. M. POULSEN

January 26, 1933

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LIGHT AERO ENGINE-AIRSCREW COMBINATIONS.

By W. R. Andrews, A.F.R.Ae.S.

(*Concluded from p. 94 of December 29, 1932, issue.*)

Part 3.—The Effect of Increased Drag.

The engines used for this investigation are those of Part 2.

For an example it is assumed that the aeroplane has the following characteristics:—

Span	28 ft.
Chord	4 ft.
Gap	4 ft.
Wing area	214 sq. ft.
Equivalent monoplane aspect ratio	4.40
Induced drag coefficient	0.149 K_L^2
Gross weight	750 lb.
K_L max.	0.57

The overall wing drag coefficients are given in the following table for a wing of 0.07 t/c.

Table 7.

K_L	K_{D_p}	K_{D_i}	K_D
0·07	0·00401	0·00072	0·00473
0·1	0·0040	0·00148	0·00548
0·12	0·00401	0·00213	0·00614
0·15	0·00406	0·00333	0·00739
0·20	0·00425	0·00590	0·01015
0·30	0·00502	0·01330	0·01832
0·45	0·00760	0·03000	0·03760
0·57	0·01800	0·04800	0·06600

If we assume a body drag of 109 lb. at 100 m.p.h. then the drag coefficient is 0.01.

Such an aeroplane would be a bad one, but it represents the extreme to the monoplane used in Parts 1 and 2.

The overall drag and t.h.p. required for level flight are given in Table 8.

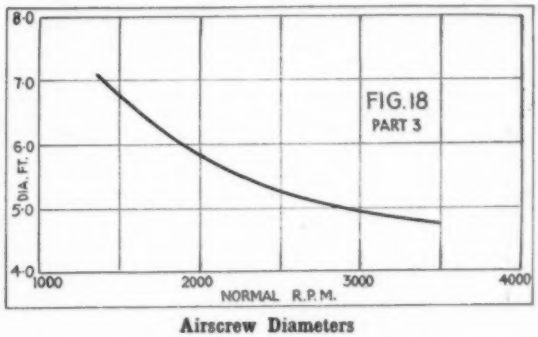
Table 8.

K_L	K_R	Drag lb.	V.m.p.h.	T.H.P.
0·07	0·0147	157·5	99·2	41·7
0·1	0·0155	116·5	82·9	25·7
0·12	0·0161	100·5	75·7	20·3
0·15	0·0174	87·0	67·7	15·7
0·20	0·0202	75·7	58·7	11·9
0·30	0·0283	70·7	47·9	8·8
0·45	0·0476	79·1	39·1	8·3
0·57	0·0760	100	34·7	9·3

If now the body diameter is still taken as 30 in., then the slip factor with 50 per cent. of body drag in the slip is

$$\text{Slip + interference factor} = 1 - \frac{4.79}{D^2}$$

The airscrew diameters are given in Fig. 18; these

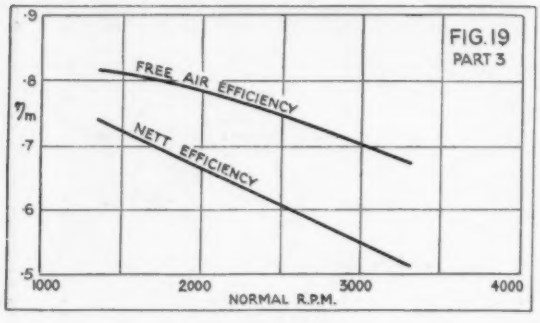


Airscrew Diameters

are larger than those in Part 2 owing to the slower speeds at which maximum r.p.m. occur.

The efficiencies are shown in Fig. 19.

Comparison with Fig. 12 reveals that at the same



Airscrew Efficiencies.

r.p.m. the free air efficiency is from 5 to 8 per cent. less in Part 3.

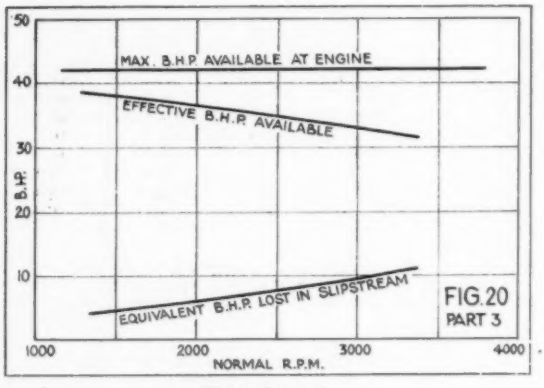
This is caused partly by the reduced speed and partly by the larger airscrews.

For maximum free air efficiencies to be the same for different diameters of airscrews, they must be so arranged that V/nD remains a constant.

The r.p.m. are fixed in our case so that for equal efficiency $\frac{V}{D}$ must remain constant.

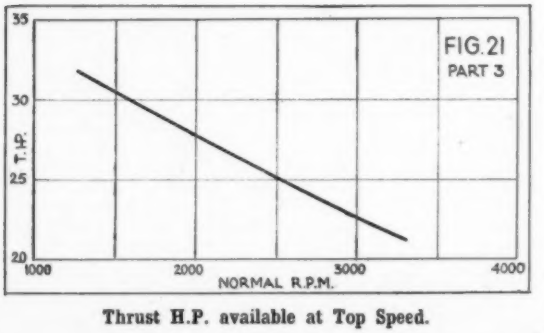
With decreasing speed at the same b.h.p. this is impossible, as an airscrew so designed would not absorb the power of the engine, so that a loss in efficiency at the same r.p.m. is inevitable.

The only way to regain the free air efficiency lost is to drop the design r.p.m. of the engine, keeping the power constant.



Work Analysis.

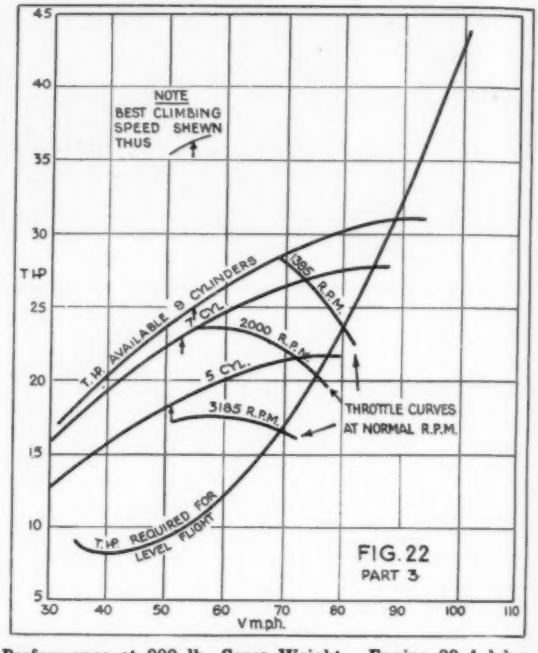
Thus at the slower forward speed one would expect the effect of r.p.m. to be more pronounced, quite apart from slipstream losses.



Thrust H.P. available at Top Speed.

This is borne out by examination of the graphs for this Part

The slipstream losses shown on Fig. 20 are slightly more than those of Part 2 (Fig. 13) but are less than the difference in t.h.p. available shown on Figs. 21 and 14 respectively.



Performance at 800 lb. Gross Weight. Engine 39·1 b.h.p. Normal.

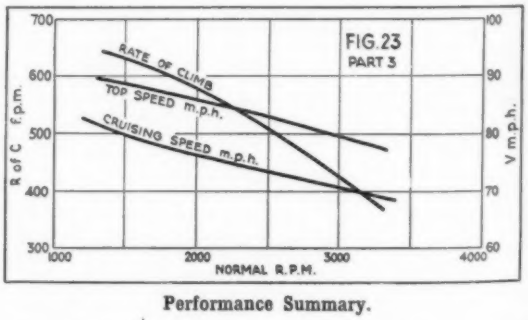
The net t.h.p. at 2,000 r.p.m. has dropped from 31.2 in Part 2 to 28.8 in Part 3, whereas the slipstream losses have only increased from 4.5 b.h.p. to 6 b.h.p. A net increase of about 1 t.h.p.

Fig. 22 shows the t.h.p. available and required.

Engine 3a (5 cylinder), it will be noticed, climbs at speeds in excess of normal r.p.m.

The performance summary is given in Fig. 23.

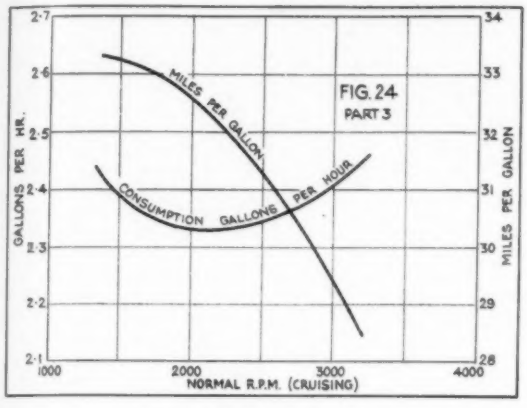
The fall off in rate of climb with increasing r.p.m. is, as expected, even more pronounced than for Part 2 (Fig. 16).



Performance Summary.

In fact, the range covered shows an aeroplane with a good climb at 1,400 r.p.m., but at 3,000 r.p.m. C. of A. requirements could not nearly be satisfied, except, perhaps, on a day when the barometer was at 31.0" Hg.

The fuel economy also shows a very marked decrease with increasing r.p.m.



Fuel Economy.

The fact that at 2,000 r.p.m. the consumption in galls. per hr. is a minimum for Parts 2 and 3 can only be taken as a coincidence. This is probably slightly influenced by the airscrew chosen not giving exactly maximum r.p.m. at top speed.

The m.p.g. is not appreciably influenced by these small errors.

For this particular case it is doubtful if any advantage would be gained by allowing the normal r.p.m. of the engine to exceed 1,800 r.p.m.

As fuel becomes cheaper the most economical design r.p.m. will increase, but what the relative values of cost of maintenance, insurance, initial costs, running expenses, depreciation and interest on capital are, must be left to those who possess the necessary information.

In choosing the engine design to suit any set conditions the problem resolves itself into one of finding a series of engines to give the same performance on climb.

If economy is necessary then the minimum power to give a rate of climb and take-off just to satisfy C. of A. requirements will be found.

Of the series of engines chosen which will give that performance, the one showing the greatest fuel economy (bearing in mind all the considerations enumerated above) will be the best for the job.

As pointed out previously, allowance for the weight of the engines should be made on the gross weight and performance.

Over small variations of weight the top speed is not affected, and the climb can be taken as inversely proportional to the gross weight.

In an article of this nature the most that can be expected is an indication of the relative effect of the more important factors.

It is undesirable to arrive at an optimum engine for any given set of conditions. Such an engine would represent the writer's own interpretation and may prejudice some suggested or existing design.

THE PARIS AERO SHOW.

By H. J. POLLARD, Wh.Ex., A.F.R.Ae.Soc.

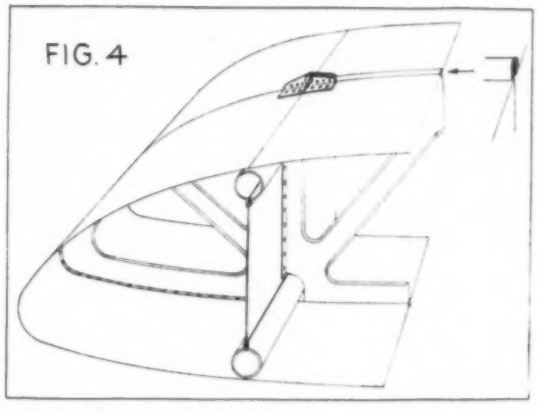
(*Continued from p. 92 of December 29, 1932, issue.*)

THE use of the ridges in the sheeting described in the previous article is bound up entirely with the question of manufacture, and the attachment of sheet covering, particularly to wings, presents some problems of special interest. The covering of *monocoque* bodies is usually an easy straightforward job, but the making of the covering of all-metal wings is quite a different matter. Only in one exhibit did the opportunity occur of seeing in detail how this was done, but an exterior examination of such wings usually gave the information required.

The time factor is the most important element in such constructions. The insertion of small rivets (sometimes through several thicknesses of material) is always troublesome, and often takes as much time as the remainder of the operation to the finish of clinching. Quicker means of making connections must be devised.

Electric welding as a final assembly process is likely to be used on a large scale in the future. The metallurgist and the structural engineer have, however, still a long way to go before the method can be applied generally to aircraft structures. At the same time, many parts of a secondary nature can be made by this process now, and progressive firms are installing equipment for this purpose. For the time being, however, riveting must hold the field, but the ultimate cost of aircraft, in so far as it is affected by this process, depends very largely on the ingenuity exercised in the design office.

A method of construction practised in many cases in the Show was as indicated in Fig. 4. In some cases



these ridges served as anchorages for fittings required for the attachment of leading and trailing edges. Wing covering ridges were used in this way on the Bloch "Sanitaire," a very neat job.

In one instance in which ribs, spars and covering were assembled in the manner shown in Fig. 4, the ribs were duralumin pressings except where they were used as aileron supports. The material of the ribs which supported ailerons was steel; the significance of that is not to be lost sight of. In other cases, notably the Polish machines and Wibault, the sheets appeared to be attached one at a time. So long as they are not too wide, say not more than 2 ft. in width, this method of construction can be carried on without the necessity for clinching rivets in very confined spaces. The closing plates are usually screwed on to stud plates fixed to ribs or other members.

The use of panels reinforced with stiffeners fixed independently of the wing ribs or spars is receiving increased attention. This was done on the Do-X, and viewed exteriorly the same principle of construction appeared to have been adopted on the Wibault wings. This, where possible, is obviously a very advantageous method, since the reinforcements can be fixed to the panels by a mechanically-operated riveter. If it is correct to say that the Wibault wings were so constructed, then quite two-thirds of the riveting could be done on panels, before the final assembly.

Alternate lengths of leading edge on the Wibault wings were screwed in place, indicating that the last part of assembly was made along this element of wing.

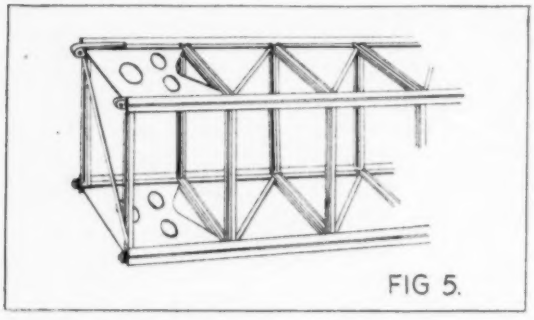


FIG 5.

The most straightforward wing-covering job by material other than fabric was to be found on the Kellner-Bechereau stand. In that case the wing spar consisted of a built-up oval tube; the underside of the tube had holes of large diameter, so that a mechanic could easily pass his head and shoulders through the series of openings provided. Thus the riveting could be performed as readily as it could in any *monocoque* body on view. These large holes were covered with reinforced plates, held in position by studs screwing into stud-plates, which in turn were secured to the stiffeners attached to the "fixed" part of the covering. The safety of such a wing having a series of manholes in the structure can only be determined by test, theory not being developed sufficiently far to allow of even an approximate estimate of the strength of the structure, but it would appear that the necessary strength and stiffness *can* be obtained in such an arrangement. The holes in the Kellner-Bechereau spar were not even of oval form, but rectangular with corners; ovalling would add appreciably to the strength. In many cases the "closing plates," *i.e.*, the plates finally secured after the completion of all the skin riveting, were attached by a series of hinges. A novel way of doing this is due to the Nieuport-Delage Company, who use ribs having boom members made from two angles placed side by side. The fixed part of the hinge is fitted between these angles, making a very simple and neat construction.

It is quite clear, then, that if metal covering is required in any particular case, a theme of design can readily be formulated which will result in the easy assembly of the structure.

Single-spar wings were not much in evidence in the Salon, the only one (before the arrival of the "Mono-spar" machine) on view being the Bernard "200" light cabin monoplane. The spar on this machine could be viewed when one wing was in the folded position. A portion of the member is shown in Fig. 5. It will be noted that this "single" spar is in the nature of two spars placed fairly close together and connected in plan view with bracing similar to that used for the shear members in the vertical planes of the two component girders. The question whether as much torsional stiffness can be obtained by this means as is obtained in the case of a single girder spar torsionally braced by means of struts and wires arranged as pyramidal bracing is debatable.

Spars of the Bernard type are being developed on the Continent. For example, a modified form of that type is in use on the Breda 32. Another type of main member used in mono-spar wing construction is the "box-spar." Such a spar, as used in the Dewoitine 500 (not exhibited), has two webs of sheet metal, lightening holes being made at intervals. The flanges consist of laminated strips, and bulkhead pressings are provided. If the distance between the spar webs is greatly increased, the spar takes the form of the well-known structural box, first brought into prominence by Rohrbach. It is not always easy to say when a wing spar ceases to be a single spar of box type and becomes a structural box. Certain constructions of this latter type were on view, notably on aircraft exhibited by the A.N.F. Company. Certain of these details which are of interest are illustrated in Figs. 6, 7 and 8. Fig. 6 shows the method of securing ribs to spars. Fig. 7 illustrates the method of making the joint at the crossing of skin stiffeners and ribs, and Fig. 8 is the con-

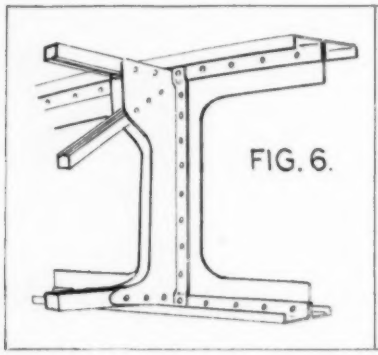


FIG. 6.

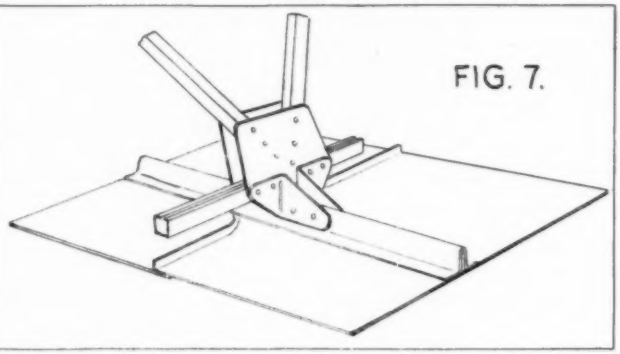


FIG. 7.

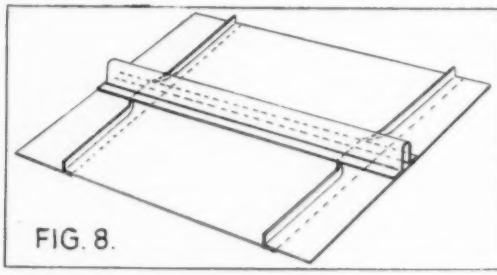


FIG. 8.

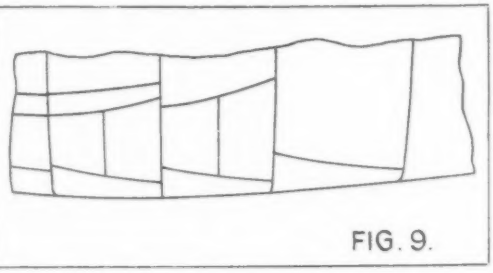
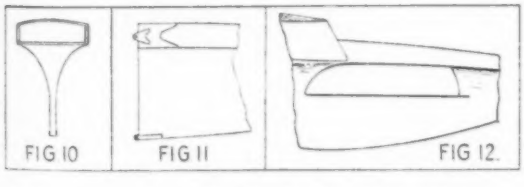


FIG. 9.

nection adopted where transverse and longitudinal members intersect. Simplicity of design is often sacrificed unnecessarily at points of crossing of framework members in rigid covered wings. That remark does not apply, of course, to Fig. 8, but the majority of joints exposed did, in fact, give the impression of unnecessary complication. Continuity of the members is a very desirable feature, but can be achieved simply by making one section deeper than the other and providing a hole through which the shallower member passes, letting the skin do the rest. This is not suggested as the ideal arrangement. It is far too early yet to say what the ideal arrangement is, but a simple idea is always a good one to start on. At the same time, the principle of "letting the skin do it" should not be carried too far. On the Kellner-Bechereau fuselage, for example, the longitudinal members were in many cases stopped off short at the bulkhead members, the continuity being entirely broken, no inter-connecting fittings of any kind being used. Remarks heard on this exhibit invariably related to the neat appearance, internal and external, of the structure, and the latter was certainly obtained by "letting the skin do it." The pleasing external appearance was due to the absence of buckles combined with easy flowing curves. This effect was obtained presumably through clever selection of the sizes and shapes of the covering plates, one length of the body being built up from plates as shown in Fig. 9. As in all matters of this sort, the proof of the construction lies in its suitability, and if complete satisfaction is given by the above fuselage, no more remains to be said, but one left this exhibit with the impression that simplicity of construction had been pushed a bit too far.

Descriptions of individual and distinctive features of the various exhibits could be continued, but enough has been said to prove beyond doubt that the use of sheet metal on an internal framework does make possible constructions that would be difficult, even impossible, of execution where fabric is used in conjunction with a primary structure. The fuselage of the Nieuport-Delage 590 is in itself a proof of that statement. Illustrations of this aircraft seen by the writer do not give an adequate idea of the extraordinary shape of this component, and a further addition to the views already shown in this and other journals is given as Fig. 10. Fig. 11 is a side view of the same portion and shows the method of holding the tail portion to the central part of the fuselage. The continuously



changing curvature of this fuselage from the stern wedge to the gunnery platform, was made possible without panel beating by the use in continuous lengths of a large number of strips of metal of varying width.

Another instance of the way in which the high strength and stiffness characteristics of sheet metal construction can be utilised to give a satisfactory special-purpose structure was the Bloch "Sanitaire." The whole side of the body could be removed for the easy fixing of stretchers, etc., the 15 in. or so depth of girder remaining being fully adequate for the airworthiness requirements.

The opponents of sheet metal structures have produced various arguments at different times, such as excessive weight and cost, lack of adequate accessibility, etc. (all of which do not bear a great deal of investigation), but the strangest of all to justify is the

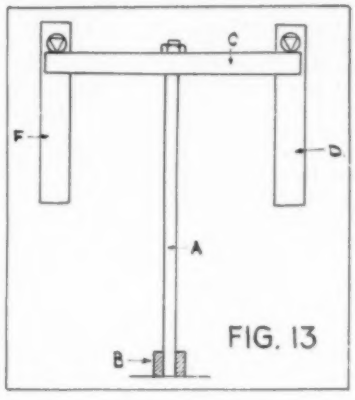


FIG. 13

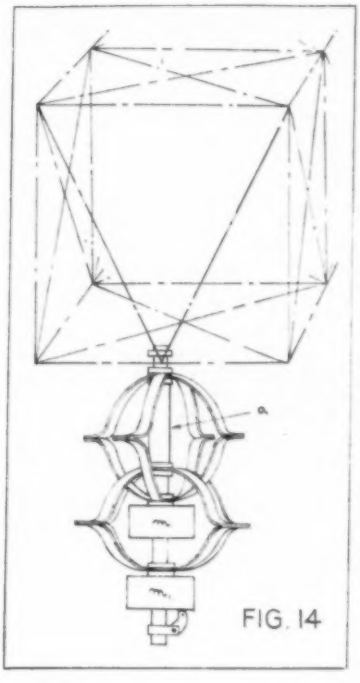


FIG. 14

statement that, immediately a hole is made in a sheet, the strength of the sheet, if not gone, is seriously impaired. The "hole" in the fuselage of the Nieuport 590 aircraft was large enough to explode that idea. A dozen people could leave the aircraft in parachutes simultaneously. The size of this opening in relation to the depth of the fuselage is as shown in Fig. 12.

A great advantage of these sheet metal stressed structures appears to lie in the fact that any damage is at once obvious to a casual external inspection. With the faired girder such is not the case, and for that reason, although the odds are very much against the happening, a faired girder *might* become unsafe through accidental damage. This could not happen to any serious extent with a sheet metal body, and for that reason alone the rigidly covered structure will have a great, perhaps—in times of popular aviation—an overwhelming advantage over the older type of construction.

One of the most interesting features of the Show was *l'Exposition du Ministére de l'Air*. Of the array of equipment and specimens there exhibited dealing with every phase of aviation down to the mechanics of fluids, the most useful, from the structural engineer's viewpoint, was certain apparatus devised by M. Sorin, Professeur at *l'Institut Polytechnique de l'Ouest*. Professor Sorin showed how the principle of the conservation of energy can be utilised for a number of new purposes.

Beginning with the simplest application of his method, *i.e.*, the determination of Young's Modulus of Elasticity, the material (conveniently in the form of a rectangular bar *A*, in Fig. 13) is held rigidly at *B*. A stiff bar *C* is fixed to the upper end of *A* and two weights are suspended from either end of the horizontal bar on knife edges. One of these (*D*) is set in oscillatory motion, in the plane of the structure. The energy thus imparted to the pendulum is transmitted through the upright to pendulum *F* (obviously if test

member *A* and the horizontal bar were infinitely rigid no motion would be transmitted).

As the swing of the pendulum *F* increases in amplitude, that of *D* diminishes, and it eventually comes to rest. The reverse process then sets in. *D* picks up a new oscillation and *F* gradually comes to rest. Now if *t* is the time between two periods of rest for a pendulum and *T* is the time for one complete swing of either pendulum (the time is the same for each, the masses being equal), *M* is the mass of the two pendulums and if *l* be the length of the vertical rod and *I* the moment of inertia of the rod about the axis of flexure, then

$$\text{Young's Modulus } E = \frac{4\pi^2}{3} \times \frac{Ml^3}{T^2} \times \frac{t}{I}$$

The idea appears to be as yet, so far as practical application goes, in the development stage only. It is not suggested that the above method should supplant any of the usual methods of determining Young's Modulus, *i.e.*, by load-deflection or stress-strain curves, but the method may have its uses in cases where the simpler methods are not readily applicable.

This principle of "pendules sympathiques," really the principle of resonance, was shown also applied to a fuselage, the object of the demonstration being the determination of the rigidity of the structure.

In this case instead of the two pendulums, two masses m and m_1 (see Fig. 14) were placed one above the other. Each weight was attached through eight single-leaf springs to the same point on the fuselage, the very stiff fitting (*a*) being required for attaching the lower weight. By means of a simple lever and trigger actuated by a Bowden control, the lower weight was given a vertical oscillatory motion (the position of the weight with trigger in place, as shown in Fig. 14, being above the position for equilibrium when freely suspended). The energy thus induced in the lower spring-weight system was imparted to the fuselage, the upper spring-weight system thus being energised.

The moving masses then act as do the pendulums in the apparatus previously described. First mass m_1 comes to rest at the same time as m reaches its maximum amplitude. A new oscillation is thus started, the movement growing and dying in each system alternately until the whole of the energy is dissipated. Professor Sorin gives the rigidity *K* of a structure as approximately equal to

$$\frac{4\pi^2 Ml}{T^2}$$

the symbols having the same meaning as in the previous expression. This gives the impression of being a useful piece of apparatus. The results which may be obtained are stated to be:—

1.—Checks on the validity of the assumptions on which the theory of the rigidity of structures is based.

2.—Conclusions relative to the differences in rigidity caused by the variations in bracing arrangements.

3.—Data may be obtained regarding the ageing effect on the rigidity of structures.

It is possible that valuable data, not obtainable by an ordinary static test for rigidity, is obtainable by these methods. Another application of the method related to the testing of hardness of material. In this case a pendulum is fitted with a hard steel ball. The pendulum then oscillates on the surface to be tested. The softer the surface the more the deformation, and the greater the diminution of the oscillation of the pendulum. The basis of the method is to compare these oscillations with that of the oscillations of another pendulum of "invariable period."

Days could easily have been spent in the halls allotted to the exhibits under the ægis of le Ministére de l'Air. This article has, however, already exceeded the length originally intended, and sketches and descriptions of spar specimens exhibited in this part of the Show must therefore be omitted, except for the final sketch, Fig. 15, which shows a type of construction which is finding increasing use abroad. This detail is taken from a Caudron specimen of construction, but the wings of the Kellner-Bechereau machine and others adopted the same principle, *i.e.*, a central structural box, the skin being reinforced with stringers, internally and sometimes externally, the shear on the "rib" being resisted by a stiff arch. Thus, internal stowage room is provided in the wing. In the particular instance illustrated the leading and trailing edges are riveted to the spar webs. This type of construction might profitably be developed further.

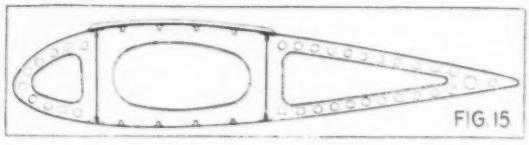


FIG 15

Practically no remarks have been made on materials. In the circumstances, it is hardly correct for an English reviewer to give his opinions on the matter, but there was no gainsaying the fact that stainless components on the Bristol and Hawker stands attracted an enormous amount of attention, usually by the informed French or other Continental technician. For years duralumin was exhibited at the shows by Continental constructors without any protective coating. Now anodic treatment of that material is well advertised. At the same time, a lag is likely to take place in the adoption of "Acier Inoxydable." We can therefore rest satisfied that our efforts are well ahead of foreign effort, and if we appear to be behind in "shell" construction, it is only because we have considered that such structures should not be undertaken on a large scale until the fundamental underlying principles are fully understood.

CEILING CAPACITY AS A MEASURE OF PERFORMANCE

By CLIFFORD W. TINSON, F.R.Ae.S.

(*Continued from p. 94 of December 29, 1932, issue.*)

Fig. 1 shows absolute ceiling against a range of values of $\left(\frac{W}{P}\sqrt{w}\right)$ for various values of K_3. It will be noted that an error in estimating K_3 of two or three leads to an error of about 700 ft. in ceiling, or an error of about 3½ per cent. on a 20,000-ft. ceiling, and less than this for higher ceilings.

The letter P is the ground power of a naturally aspirated engine, so that when a supercharged engine is used it is necessary to use a fictitious ground power P_E, such as would be given if the power curve were extended to ground level. Fig. 2 gives the percentage of sea level at full throttle for supercharged engines,* so that if a particular engine has a rated altitude of 13,000 ft., the equivalent ground power P_E is obtained by dividing the power at 13,000 ft. by 0.642.

Turning now to the other characteristic of ceiling "performance," namely, ceiling speed, from which the speeds at various heights below ceiling are to be calculated, this ceiling speed V_a may be calculated from the stalling speed V at ground level.

It has been shown† that the average speed at which

* "Handbook of Aeronautics," p. 449.
† N.A.C.A. Report No. 368, "Absolute Ceiling," by Diehl.

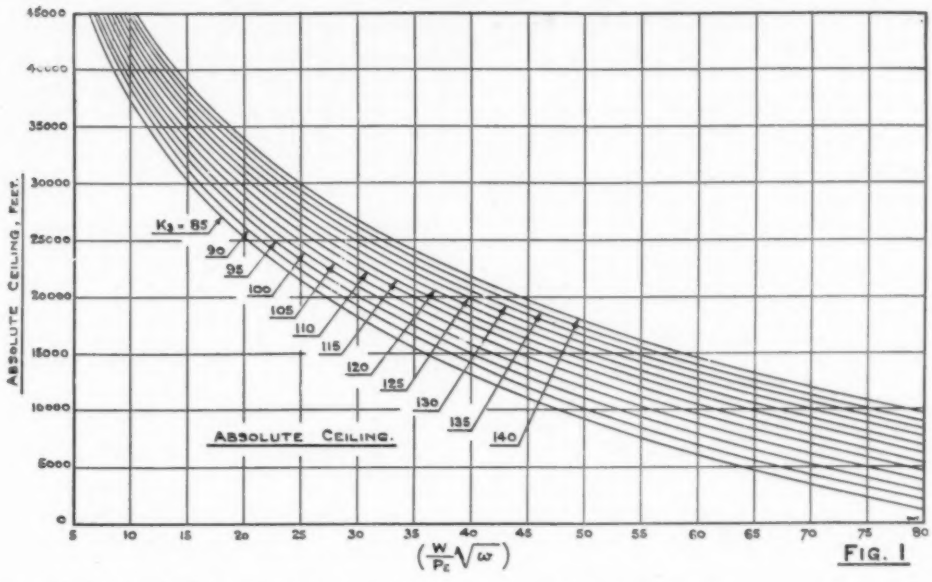
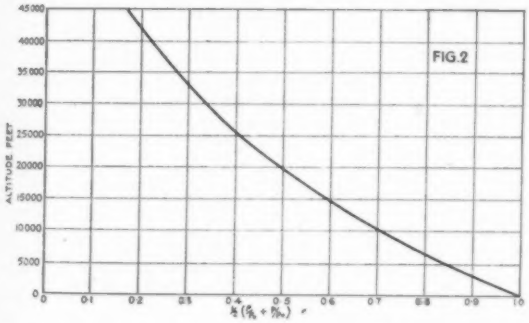


FIG. 1

the curves of power available and power required are tangent at the absolute ceiling is 17 per cent. greater than the stalling speed. Now the stalling speed is known as soon as the maximum lift coefficient and wing



loading are known, so the ceiling speed V*a* is then found direct.

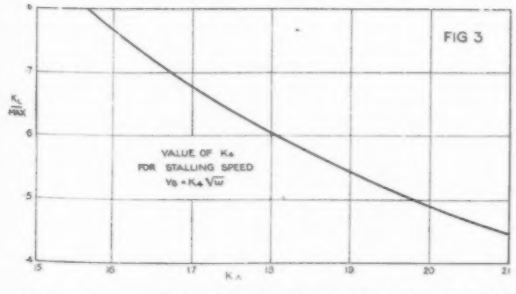
The stalling speed is, of course,

$$V_s = K_4\sqrt{w},$$

where V_s = stalling speed in m.p.h.

w = wing loading in lb. per sq. ft.

In Fig. 3 is plotted the value of K_4 against maximum lift coefficient K_L for use in this expression.



Thus, the speed at absolute ceiling V*a* may be taken as

$$V_a = 1.17\ V_s\sqrt{\rho_0/\rho},$$

where the value of ρ_0/ρ appropriate to the absolute ceiling already determined from Fig. 1 is taken. For convenience, the values of $\sqrt{\rho_0/\rho}$ against altitude are plotted in Fig. 4.

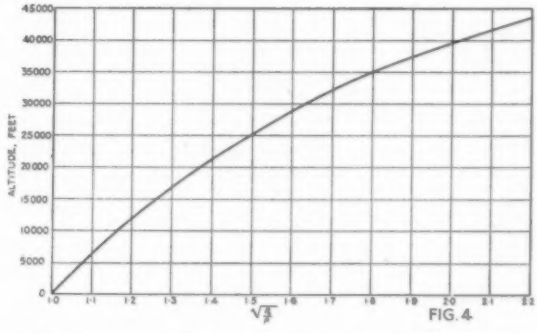


FIG. 4

The increase of speed from ceiling downwards is dependent upon density and on increase of propeller r.p.m., unless the propeller is adjustable in pitch angle in flight, for the revs. increase as the machine gets further from its absolute ceiling, and the speed increases due to this as well as due to the difference in density. To avoid misunderstanding, this paragraph refers to the speed variation in the general case, in which the max. speed level increases on the way down until it reaches its highest value at or near the rated altitude, or at ground level if the engine is not supercharged.

(To be continued.)

TECHNICAL LITERATURE

SUMMARIES OF AERONAUTICAL RESEARCH COMMITTEE REPORTS

These Reports are published by His Majesty's Stationery Office, London, and may be purchased directly from H.M. Stationery Office at the following addresses: Adastral House, Kingsway, W.C.2; 120, George Street, Edinburgh; York Street, Manchester;

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EXPERIMENTS WITH A SUPERCHARGED SINGLE-CYLINDER UNIT. By G. F. Mucklow, M.Sc. Communicated by Prof. A. H. Gibson, D.Sc. R. & M. No. 1460. (57 pages and 43 diagrams.) November, 1931. Price 3s. net.

This paper deals with experiments carried out in the Engineering Laboratory of the University of Manchester on two different types of aero-engine cylinder. The cylinders were mounted on a R.A.E. Universal test bed, and supplied with compressed air from a separately-driven Reavell compressor, the air being passed through an inter-cooler before being supplied to the carburetter.

The object of the experiments was to examine the effects of increased induction pressure, at a range of compression ratios, on the behaviour of the cylinders in regard to such variables as power output, heat losses and fuel consumption.

The cylinders used for the tests were :—(1) A Napier E. 77 type, two-valve, all-steel cylinder ; and (2) a Rolls-Royce F.-type, four-valve cylinder, having a steel liner and aluminium alloy head.

A set of trials was first carried out using the Napier cylinder, at compression ratios of 4·5 to 1, 4·0 to 1, and 3·5 to 1. "Straight" Shell No. 1 petrol was used, the engine speed being 1,600 r.p.m. throughout.

During each trial measurements were made of the induction pressure, the power output, the petrol and air consumption, and the heat flow to cylinder jackets and to exhaust. With the Napier cylinder, separate trials were run at each compression ratio when the maximum cylinder pressure was recorded at a range of compression ratios, using an Okill pressure indicator.

On completion of the above tests, the Rolls-Royce cylinder was mounted on the test bed and a second set of trials was carried out at an engine speed of 1,600 r.p.m. Except for one series of trials with petrol at 4·0 to 1 compression ratio, the fuel used with the Rolls-Royce cylinder was in all cases pure benzole. With this fuel a series of trials was carried out at each of the following compression ratios, viz., 4·0, 5·0, 5·5, 6·0, 6·5, and 7·0 to 1.

The results indicate that :—

(1) At all compression ratios the permissible mixture range is narrowed by increase of induction pressure.

(2) As the compression ratio is raised, at any given induction pressure, the working mixture range is extended.

(3) If the ignition timing remains unaltered, the complete range of permissible mixture strengths moves progressively towards the weak side as the induction pressure is increased. By retarding the ignition, the mixture range is moved back towards its position at normal induction pressure.

(4) Although the mixture strengths for maximum power and maximum efficiency alter in conformity with the movement of the complete range, the respective mixture strengths giving maximum heat flow to the jackets and to exhaust remain unaltered under all conditions.

The alterations in the permissible mixture range referred to above are more pronounced in the results from the Rolls-Royce cylinder under all conditions than in those from the Napier, in addition to which the available mixture range is in all cases wider with the latter cylinder.

The volumetric efficiency, taken as the ratio (weight of air actually consumed) ÷ (volume swept by the piston × density of air at induction temperature and pressure), increases considerably as the induction pressure is raised, the rate of increase becoming progressively less as the supercharge is increased. At a given induction pressure the rate of increase in volumetric efficiency becomes less as the compression ratio is raised. Thus, whilst at normal induction pressure the volumetric efficiency is approximately the same at all compression ratios, under supercharged conditions the volumetric efficiency is reduced by an increase in compression ratio.

The rise in volumetric efficiency under supercharged conditions appears to be due to the fact that, under these conditions, not only has the swept volume to be filled with air, but in addition a further supply is required to fill up the clearance space, since at the commencement of the charging stroke this space will contain residuals at approximately atmospheric pressure.

At a given compression ratio, the ratio (I.H.P.) ÷ (weight of charge per minute) is constant and independent of the induction pressure, provided conditions are not such as to require a seriously retarded ignition timing. The value of the ratio is moreover, the same for both cylinders at the same compression ratio, and remains unchanged whether the fuel is petrol or benzole.

With constant induction temperature the I.M.E.P. increases at a constant rate as the induction pressure is increased. For the Rolls-Royce cylinder, at the maximum power mixture strength, the value of the ratio (percentage increase in I.M.E.P.) ÷ (percentage increase in absolute induction pressure) is approximately 1·155 at all compression ratios.

For the Rolls-Royce cylinder, irrespective of compression ratio, the mean value of the ratio (percentage increase in B.M.E.P.) ÷ (percentage increase in absolute induction pressure), at maximum power mixture strength, is approximately 1·49 with the supercharger separately driven, and approximately 1·27 when allowance is made for the supercharger being driven from the engine at 65 per cent. adiabatic efficiency, though in the latter case the ratio tends to decrease slightly as the induction pressure is increased.

For the Napier cylinder, using petrol, the above ratio (supercharger separately driven) increases slightly as the compression ratio is reduced, and decreases at each compression ratio as the induction pressure is raised, the approximate mean values being 1·53 at 4·5 to 1, 1·58 at 4·0 to 1, and 1·63 at 3·5 to 1 compression ratio.

At a given compression ratio the indicated thermal efficiency remains approximately constant at all induction pressures, provided that the ignition does not require to be retarded seriously, and that, at the lowest compression ratios, the induction pressure is sufficient to ensure an adequate degree of turbulence.

Subject to the above conditions, the ratio of the indicated thermal efficiency to the theoretical air cycle efficiency is constant at all compression ratios, the value of the ratio being approximately 0·617 for the Rolls-Royce cylinder at the 98 per cent. full power mixture, using benzole as fuel.

With the mixture strength adjusted to give 98 per cent. full power, and the supercharger separately driven, the gain in brake thermal efficiency with increase in compression ratio is appreciably greater at normal induction pressures than is indicated by the expression giving the standard air cycle efficiency. As the induction pressure is raised the ratio (observed efficiency) ÷ (air cycle efficiency) tends to increase more slowly with increase of compression ratio, until, when conditions are such as to demand an appreciably retarded ignition timing, the ratio reaches a maximum value and thereafter diminishes slightly.

At each compression ratio, with the supercharger separately driven, the fuel consumption per B.H.P. (at 98 per cent. full power) decreases as the induction pressure is increased, the rate of decrease being greatest at the commencement of the range and becoming less as the supercharge is increased. At a given induction pressure, the rate of decrease becomes less as the compression ratio is raised. At each compression ratio a point is reached when further increase of induction pressure no longer gives a decrease in specific consumption, this point coinciding with the point at which conditions become such as to demand an appreciably retarded ignition timing. At the point referred to, for the Rolls-Royce cylinder, the decrease in specific consumption, expressed as a percentage of the value at normal induction pressure, is approximately 26 per cent. at 4·0 to 1 ; 16 per cent. at 5·0 to 1 ; 9 per cent. at 6·0 to 1 ; and 5 per cent. at 7·0 to 1 compression ratio. When allowance is made for the supercharger being driven by the engine (at 65 per cent. adiabatic efficiency), the above percentages become approximately 16 per cent. at 4·0 to 1 ; 8 per cent. at 5·0 to 1 ; 4·0 per cent. at 6·0 to 1 ; and 1 per cent. at 7·0 to 1 compression ratio.

DEVELOPMENT OF A HIGH-SPEED INDUCED WIND TUNNEL. By A. Bailey, M.Sc., A.M.Inst.C.E., and S. A. Wood, M.Sc. R. & M. No. 1468. (21 pages and 15 diagrams.) May, 1932. Price 1s. 3d. net.

In 1929 the Aerodynamics Sub-Committee of the Aeronautical Research Committee initiated, at the suggestion of Professor G. I. Taylor, an investigation of the possibilities of using the inductive action of the discharge from the Compressed Air Tunnel to maintain a high-speed wind tunnel. Preliminary experiments were made by Sir Thomas Stanton, and a report was presented by him in 1931. He devised means to maintain an air speed of 964 ft. per second at the entrance to a tunnel 2¼ in. in diameter with a parallel portion 1 in. long. The axial distribution of velocity was irregular, but the radial distribution was good.

The object of the present work was the attainment of (1) a longer working section ; (2) a possible increase in the working velocity ; (3) uniformity of speed over the working section.

The new experiments showed that (1) The inductive effect of a central conical nozzle, when used alone or in conjunction with an annular nozzle, is not great when compared with that of an annular nozzle taking the same quantity of high-pressure air.

(2) Increasing the length of the working section of the original tunnel considerably reduced the maximum speed attainable. The most satisfactory method of overcoming this was found to be an increase in the area of the annular nozzle. By this means the maximum velocity in a parallel tunnel 1¼ diameters in length can be raised to 990 ft. per second.

(3) The efficiency of an induced wind tunnel such as the one used may be raised by increasing the length of the divergent outlet from 13 to 24 diameters.

(4) By giving the working section a divergence of 0·5 per cent. on the diameter, uniform velocities up to about 980 ft./sec. can be maintained with nozzle pressures of 75 lb. per sq. in. absolute and upwards, over a length of 1¼ diameters.

ESTIMATION OF WING SURFACE AREA FOR EVAPORATIVE COOLING. By C. Anderton Brown, A.M.I.Mech.E., and A. W. Morley, M.Sc. Communicated by the Director of Scientific Research, Air Ministry. R. & M. No. 1481. (23 pages and 12 diagrams.) March, 1932. Price 1s. 6d. net.

The development of evaporative cooling of the aircraft engine brings forward the possibility of using aircraft wings as condensers, thus avoiding radiator drag. Sufficient wind tunnel data is available to make the cooling from a wing surface a calculable quantity and flight test development has taken place.

The results of R. & M. 1163 and R. & M. 1326 have been correlated in an attempt to find a fundamental law for heat transfer from aerofoil surfaces, and the data given in R. & M. 1163 have been examined for a concise manner of applying to practice the emissivity variation of an aerofoil in flight.

A simple law can be formulated to satisfy very approximately the results of R. & M. 1163 and R. & M. 1326 for cooling from the same specified proportions of profile. This appears well established for the model tests and, if it applies with the same accuracy to full scale aerofoils, cooling from a surface occupying specific proportions of the wing profile may be determined within practical limits. Cooling from a surface occupying other portions of the profile can then be found directly by applying the simplified data concerning distribution of emissivity.

In Appendix III the cooling from a water jacketed aerofoil is compared with that of the steam condenser described but with the information available the numerical relationship cannot be evaluated accurately.

NOTE ON THE RELATIVE TEMPERATURES ATTAINED BY SPECIMEN OF 70/30 BRASS WHEN SUBJECTED TO CYCLES OF REVERSED DIRECT STRESSES IN VACUO AND IN AIR. By H. J. Gough, M.B.E., D.Sc., and D. G. Sopwith, B.Sc.Tech. R. & M. No. 1482. (4 pages and 2 diagrams.) June, 1932. Price 4d. net.

In a recent paper* the authors reported the results of fatigue experiments made in air and in a partial vacuum. The results showed broadly that, in general, an improvement in the fatigue limit under reversed direct stresses was obtained when a partial vacuum was substituted for air as the environment. The improvement effected was small in the case of steels (maximum 5 per cent. increase) but was considerable with annealed copper (13 per cent.) and extremely marked with annealed 70/30 brass (26 per cent.).

In order to clear up one possibility, experiments were made in order to determine whether or not the increases in fatigue limits of materials when tested *in vacuo* were influenced by temperature differences caused by the different conditions.

Comparison of the results of the two tests on 70/30 annealed brass at ± 9 tons/in.², as regards the temperatures attained, shows that the temperature difference between the specimen and holders was very similar during the first three hours of each test, after which the specimen in air fractured, that *in vacuo* continuing for 12 days (35×10^6 cycles) without fracture. The actual temperature of the specimen in these two cases was identical over the same period. The maximum temperature attained after primary hysteresis had ceased was about 30° C. It is therefore concluded that the difference in fatigue limit in air and *in vacuo* cannot be attributed to any temperature effects.

* See Journ. Inst. of Metals, No. 2, 1932, Vol. 49.

From the Clubs

LONDON AEROPLANE CLUB

There may have been slumps and rumours of slumps, but the London Aeroplane Club can show quite a good record for the year 1932. The five machines owned by the Club have totalled 2,420 flying hours, which is an average of 484 per machine. Thirty-five pupils passed "A" licence tests and three "B" licence, among the latter being Miss Jean Batten. The instruction of members in the hangar continues to be popular, no fewer than 34 pupils having passed through the course of aircraft maintenance under Mr. A. E. Mitchell, the Chief Ground Engineer; this number includes 24 pupils from the de Havilland Technical School, with which the Club co-operates. Incidentally, the hangar staff has been particularly busy, as the Club has no fewer than 10 members keeping machines in the hangars, which include such varied types as "Fox Moth," D.H. 53 and Comper "Swift." Blind flying is an important branch of the Club's activities, and the machine fitted with the latest Reid & Sigrist instruments is in constant demand. Among those who have sampled it are Lt. Herzbendt, of the Polish Embassy, and Lt. Com. Colson, R.N.

As regards the social side of the Club, a series of successful dances has been held in the club-house, culminating in the one at the Park Lane Hotel, where over 300 were present. Messrs. G. H. Craig and W. R. Oliver have done much excellent voluntary work in organising these dances. Mr. M. P. S. Spencer, who has been with the Club three years, has left to take up an appointment elsewhere, and his place has been most efficiently filled by Miss F. O'Connell; the flying staff still consists of Maj. H. G. Travers as chief instructor, with Mr. Nigel Tangye as assistant.

For the first time since the Club's formation six years ago, good business justified its being kept open throughout the whole year.

The first of the year's Landing Competitions was held on Sunday afternoon, January 22, and was won easily by Miss Ruth Nicholson, Mr. W. R. Oliver being second. Miss Nicholson's win was particularly creditable, seeing that she had not flown for two months.

NATIONAL FLYING SERVICES, HANWORTH

Bad weather and poor visibility has restricted flying throughout the week, only local instruction being carried out, but in spite of mist and wind the Lowe-Wylde "Baby" machines have done much flying; in fact, up to date 115 hr. have been flown, representing a distance of five or six thousand miles, and no engine or airframe trouble has been experienced. More wonderful still, however, is the action of the Air Ministry, who have granted permission for these machines to be flown within three miles of Hanworth and Heston. So on the occasion of Sir John Simon's visit to the latter aerodrome Mr. Lowe-Wylde flew across, and the weather was so bad that all general flying had been stopped.

Lt. H. Kidston, R.N., began solo flying during the week, and hopes to take his "A" licence during the week-end. The workshops are exceptionally busy, one very interesting visitor being the Budd amphibian. On Tuesday, January 17, the company were represented at the funeral of Miss Winifred Spooner, by Flt. Lt. Max Findlay, who travelled by air, landing beside the church at Hinton Parva.

BROOKLANDS

The Brooklands School of Flying has now taken over the Northamptonshire Aero Club, and the first meeting of that Club, under the new management, will be on February 4. Brooklands Club realise the necessity of fitness in airmen, and in the past have always endeavoured to provide facilities for physical training. The club-house is already equipped for deck tennis and shower baths are available; now one of the spare buildings is to be permanently fitted out as a gymnasium, which will include a badminton court.

A new warning signal has now been installed in the control tower for use in emergencies. It consists of a hooter, operated by a button in the tower, which can be heard all over the aerodrome; a blast from this hooter, or a hoot from this blaster, will fetch all personnel on to the aerodrome, where they will take up appointed stations.

Sir Philip Richardson has hit on an excellent plan for entertaining his younger guests. He brings them over in large parties to Brooklands by car, arranges short flights, and gives them lunch and tea at the club-house, which he maintains they enjoy much more than a visit to a theatre. Sir Philip is a very well-known and popular figure, and was for some time M.P. for Chertsey.

READING AERO CLUB

The chief item of news from Woodley this week, as those wise souls who read, mark, learn, and inwardly digest their weekly aviation periodicals will notice (yes,

A COSMOPOLITAN LIGHT PLANE: This pleasing light plane, constructed by Max Gerner of Frankfort-on-Main, has been fitted with a British 80-h.p. Pobjoy engine by its owners, T. Drndarski, of Osijek, Yugo Slavia—who, by the way, is extremely pleased with the results obtained with this power plant. The machine has a span of 7 m.; a length of 6 m.; a wing area of 18 m.^{2}; and weighs 320 kg. empty or 550 kg. fully loaded. With the Pobjoy engine its speed has been increased to 112 m.p.h.

even advertisements are worth reading at times), is the fact that it is now possible to learn to fly at Phillips & Powis School of Flying, for £37, inclusive and irrespective of the number of hours taken. This will be a great advantage to the man who takes a long time to learn, but having once learned is very proficient, and there are many such.

Mr. Ahmed Ibrahim, an Egyptian subject, has joined the Club, and is going through the course for a "B" licence.

MAIDSTONE AERO CLUB

On Sunday, January 22, a Scavenger Hunt was held. Many attended in the afternoon to fly, proceeded with the Scavenger Hunt, and finally stayed on for the Sunday evening dance. On Sunday, January 29, the Club are holding a "Strangers' Welcome," and any in the district who are interested in aviation or its future will be welcome. As regards flying, the Club has now available a Blackburn "Bluebird" for variation in instructional work, and members are taking every opportunity to try the side-by-side seating. Considerable overhauls have been completed to the "Moth" in which Mr. Victor Smith flew from the Cape and which is now the property of Lady Heath.

NORTHAMPTONSHIRE AERO CLUB

The flying side of the Northamptonshire Aero Club at Sywell will shortly be controlled and operated by the Brooklands School of Flying with Mr. Thorn as instructor. It is hoped shortly to purchase a 75-acre field, adjacent to the present Sywell aerodrome, into which the Club will move during September. Mr. K. Hall, one of Brooklands' engineers, will come up to Sywell as Chief Ground Engineer; he holds "A," "B," "C" and "D" licences.

The first meeting of the Club under the new management will be on February 4, when there will be a subscription dinner and dance; on the following day the Club will be "At Home."

THE HERTS AND ESSEX AEROPLANE CLUB

At the conclusion of its first full year's working, the Club is able to report excellent progress. Operations were commenced in April, 1931, with a handful of members, one "Moth," an undeveloped field, and a small hangar, which served the purposes of club-house and workshop. During 1932 another "Moth" was acquired, 10 acres were added to the aerodrome, a large hangar erected, and the membership increased until it stood at 250. Also plans were considered for the extension of the club-house to comprise a billiards room and seven additional bedrooms, which should be completed by March, 1933. The hours flown during the year amounted to 1,828 on 2,990 flights, carrying 4,660 persons. Twenty-eight additional members received "A" licences, whilst two more received "B" licences, one of whom was Roger Frogley, a founder-member of the Club, who in June, 1932, was appointed assistant pilot-instructor, and in August promoted to chief instructor. Two displays were organised during the year, both being a great success.

A handsome silver cup, known as the "Woodside" Challenge Cup, was presented by Mr. William Sanders, the competition for which taking the form of a pin-pointing cross-country flight, finishing with a landing over a tape. It was won by Mr. G. H. L. Curtis on November 27, in foul weather. Two landing competitions were held towards the end of the year, which were won by Messrs. Curtis and E. L. Gay.

The Club has received an enormous amount of assistance from Flt. Lt. A. B. Woodhall, who has acted as honorary instructor. He is, however, departing to Martlesham, and Flt. Lt. Duncanson has kindly offered to take his place.

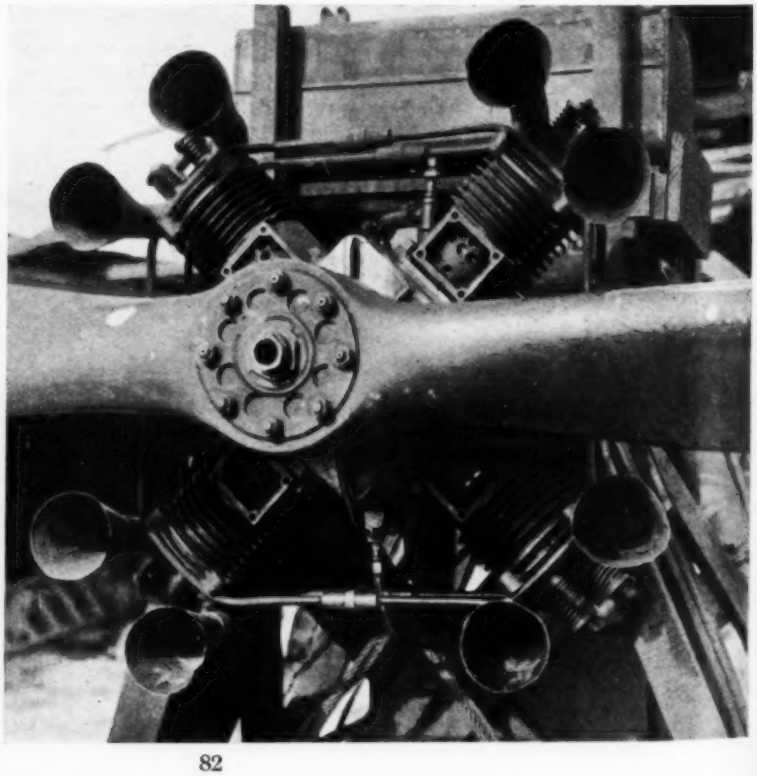
The second annual dinner and dance has been arranged to take place on February 8 at the Wharncliffe Rooms, Hotel Great Central, London, and it is hoped this function will be as successful as its predecessor.

NORFOLK AND NORWICH AERO CLUB

The Club reopened on January 3 after the staff Christmas holidays and much time has already been put in. Miss N. Bagge, Messrs. H. Birchall, A. R. Colman and H. C. Stringer went solo, while Mrs. G. Kwantes, Mrs. A. R. Colman, Miss Inglis, Miss G. Bagge and Messrs. J. Collier and F. T. Wynward-Wright received instruction from Mr. J. Collier. In the absence of Mr. A. Kirby, who has been in hospital recovering from an operation, Mr. C. Browne, of Messrs. Boulton & Paul, Ltd., very kindly assisted in testing and passing out machines. The Club is also indebted to Mr. J. N. Wiley, of the Manor House, Little Plumstead, for allowing a field to be used in practising forced landings during January and

A LIGHT-WEIGHT DIESEL ENGINE FOR LIGHT PLANES

What he considers to be the answer to the need for a light-weight Diesel engine for small light aircraft has been constructed and bench-tested by E. Norrbom in America recently. Working after hours as a mechanic at a well-known aircraft factory he took two and a-half years to build this new and original engine, shown in the accompanying illustration. It is a 4-cylinder radial engine, weighing 250 lb. and developing 150 h.p. at 1,400 r.p.m. (incidentally, fitted with an airscrew designed for a 180-h.p. engine). It differs in many features from other Diesel engines; it is of the two-cycle type, and has no gears or air charging pumps—employing air scoops that pick up "propeller blast"; it embraces internally-cooled pistons of a new design, and operates on any kind of low-grade fuel or furnace oil.



February. A children's party was held on Tuesday, January 10, at which Father Christmas arrived by air, and on January 21 another supper dance was held at the Club. On Sunday evening, January 8, Mr. F. T. Wynward-Wright, M.A., A.C., gave an interesting and enjoyable lecture on the "Art and Technique of Mountain Climbing." Mr. Wright illustrated his lecture with lantern slides. He compared mountain climbing to flying, stating that in both it was much easier to go up than to come down, that is, of course, if one wanted to come down, and in the correct and safe way. Both airmen and climbers experienced the same exhilarating effect of heights, and were rewarded by the same glorious views. Sir Alan Cobham kindly lent his cineprojector and showed us some good films of his own.

THE CINQUE PORTS FLYING CLUB

The Cinque Ports Flying Club at Lympne reopened after Christmas on January 13. The weather so far has not been a great asset, but in spite of this a number of old members came to wish the Club a "Happy New Year," and to do a little flying.

The machines have now been through the Brooklands repair shops and have emerged repainted and looking very spick and span.

The annual dinner and dance will be held at Folkestone on February 3, and it is hoped everybody who possibly can will attend.

THE HAMPSHIRE AEROPLANE CLUB

During the year 1932, 1,612 hours were flown on Club aircraft. In January we took delivery of a reconditioned "Gipsy I Moth," and shortly afterwards a new three-seater "Gipsy II" Spartan.

In addition to complete overhauls of engines, all repairs to airframes were carried out at the Club by our chief engineer, Mr. E. Lenny, and his assistant, Mr. S. W. Riches. This work included completely rebuilding a "Cirrus Moth" which had been practically written off.

During the summer months the three-seater "Spartan" was used regularly joyriding around Hampshire, with very good results. In June Mr. K. C. Winton joined us from C.F.S. as assistant instructor.

During the year 24 new members qualified for their "A" licences, and 45 "A" licences were renewed by old members. One member, Mr. N. Richardson, took his "B" licence, in addition to his second-class navigator and his W/T certificates.

Among members to qualify for "A" licences were four ladies.

Members of the R.N.F.C. are honorary members of the Club, and have put in a considerable amount of flying during the year.

Mrs. Alington and one of her sons, Mr. W. J. Alington, qualified about the same time. Mr. Alington, who is an officer in the Merchant Service, qualified in eleven days while his ship was lying in dock. Mr. Eric Verdon-Roe, Sir Alliott's eldest son, qualified three months before his seventeenth birthday.

Lady Young, who towards the end of the year flew out by Imperial Airways with her family to join her husband, Sir Hubert Young, Governor of Nyasaland; Lord Kimberley's stepson, Mr. M. R. Montagu, aged 17; Capt. Brodie and Capt. Peters, both R.N., all took their "A" licences. Three doctors also qualified, bringing the total number of doctors who fly regularly here to seven. Mr. R. C. Freaker, another officer in the Merchant Service, qualified during November while his ship was lying in Southampton Docks.

Early in November the Club was transferred from Hamble to the Southampton Municipal Aerodrome at Atlantic Park, and members quickly settled down to the new surroundings. We have already found the advantage of being nearer to Southampton, and being in a more central position in the county. The fact that the aerodrome is now only seven or eight minutes' walk from the Corporation tram-cars overcomes the transport difficulty of Merchant Service officers, who we find are very keen on learning to fly while their ships are being overhauled in the docks.

With regard to recent happenings, flying has been curtailed considerably this month owing to the thick fog and rain, but we have managed to do 25 hours to date. We were very pleased to see Lord Apsley, who dropped in last week in a Parnall "Elf." Col. Strange and Mr. R. E. F. Potter, of Spartan Aircraft, Ltd., both members of the Club, are very frequent visitors by air.

Our "Moths" are now fitted with Dunlop wheels, whereby we hope to save the air surrounding our chief ground engineer in the matter of broken longerons, etc.

During the year we had 342 members, 220 of these being flying members.

THE AIRCRAFT CLUB, HARROGATE

The Club has acquired soaring rights at Ingleby Greenhou which is one of the finest soaring sites in the country; also permission has been granted to use and adapt the buildings at the top and bottom of the incline. The Club hopes to keep the place open during week-ends and on holidays, while at Easter there is to be a special concentration of sailplanes. Any enthusiasts from other parts of the country who would like to take this opportunity of trying out this wonderful site should communicate with the Hon. Sec. In place of the complicated system of "A," "B" and "C" certificates and badges, this club simply awards its gold (plated) badge to members who have stayed up one hour, attained a height of 1,000 ft. or covered a distance of 10 miles. Mr. Slingsby has won the first badge.

Maj. H. Hemming's Lecture

WITH reference to Maj. H. Hemming's lecture on "Aircraft in Relation to Petroleum Technology," which appeared in last week's issue of FLIGHT, we should have indicated that the photographs were taken by the Aircraft Operating Co. Maj. Hemming also points out a slight error he made in his estimate for the operation of the small type economical air transport machine. The 5 per cent. interest on capital cost of £2,200 should, of course, be £110, not £210, making the total annual charge £2,045, not £2,145.

Human Limits in Flying

WING. COM. G. S. MARSHALL, O.B.E., M.R.C.S., L.R.C.P., who is lecturing on the Physiological Limitations of Flying before the R.Ae.S. on Thursday, January 26, is of the opinion the present aircraft speeds and heights are reaching the limits which pilots can normally withstand without taking special precautions. Even with the use of oxygen apparatus he believes the limit is being reached. To quote from his lecture: "I am of the opinion that the safe limit of height for a person breathing pure oxygen is 42,000 ft. if he is to take moderate exercise, and 44,000 ft. if he is merely to go up and come down again immediately. I would emphasise that these figures represent what I regard as the limit of safety, and not the limit of possible performance."

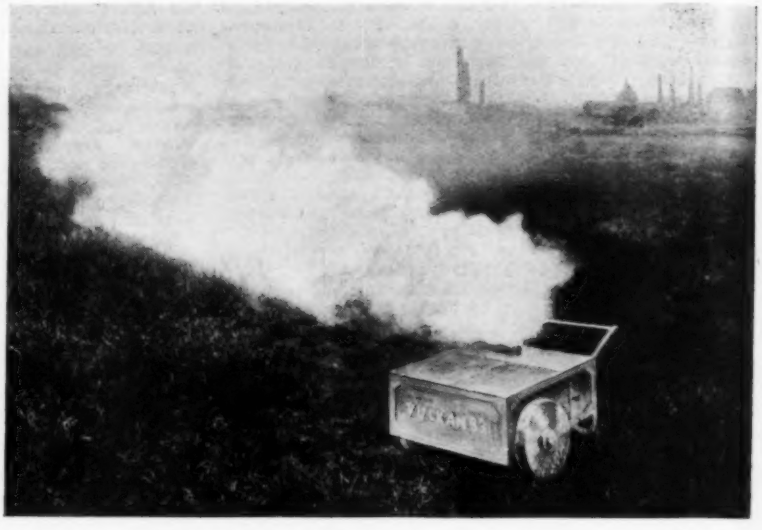
Wing Com. Marshall deals in his lecture with the precautions which must be taken when flying at great heights and speeds, without which there will be considerable danger. "In some directions the developments of modern mechanics have brought man within sight of his natural boundaries or even in touch with them."

Some of the conclusions to which Wing Com. Marshall arrives are controversial, and it is hoped that all those who have had any experience of the physiological limitations of the human body will attend the lecture, and if possible give those present the benefit of their experience. The lecture will be at 6.30 p.m. in the Lecture Hall of the Royal Society of Arts, 18, John Street, Adelphi, W.C.2, and will be illustrated with slides.

Air Bumps and Some Others

THE January issue of the Handley-Page Bulletin records a test on air bumps and other kinds of bumps made by Mr. H. E. Wimperis, Director of Scientific Research at the Air Ministry. During a recent flight to Paris and back in the Handley-Page "Helena," Mr. Wimperis took with him an Elliott Maximum reading accelerometer. On the outward trip the air was so smooth, the machine so stable and the piloting so good, that the maximum reading was 1.1 g. On the return journey, when the air was much bumpier, the maximum reading was only 1.3 g. On the motor-coach trip from London to Croydon and between Paris and Le Bourget Mr. Wimperis' accelerometer readings were 2¾ g. in the first case and 4¼ g. in the second.

INDICATING THE WIND DIRECTION



CLEAR indication of the direction of the wind is a matter of paramount importance at all aerodromes. One of the most accurate ways of achieving this indication is undoubtedly by means of a small smoke generator laid out in the middle of the aerodrome. Not only is this very easily seen from the air, but also it has the great advantage that it indicates the direction of the wind at the exact spot where the pilot wishes to land his aircraft, and not, as in the case of a wind stocking, at some place distant from it. In FLIGHT for June 5, 1931, we described the Ahrens smoke wind indicator, which was at that time installed at the London Air Park, Hanworth Park, Feltham. During the past two years National Flying Services, Ltd., have operated this indicator without the slightest trouble and beyond the daily starting, stopping and cleaning operations they have not had cause to do anything with it.

They tell us that provided the burner jets are kept clean and that care is taken to avoid the presence of foreign bodies in the oil tank, pipe lines and petrol system, no trouble of any kind whatsoever is experienced. Since the installation of the indicator at Hanworth, two others have been installed, one at the R.A.F. Station at Cranwell and another at the Air Park of London, Croydon, both of which have given satisfactory service. Our illustration shows a new portable type of indicator made by the Ahrens people and handled in this country by National Flying Services, Ltd. This indicator acts on exactly the same principle as does the standard flush type, but has the advantage that it can be moved to any temporary landing ground with ease.

THE PASSING OF A PIONEER : A photograph of the impressive funeral of Santos Dumont, in Rio de Janeiro, which took place on December 21. The photograph shows the cortege, headed by representatives of Naval Aviation, with a D.H. "Moth Trainer." During the procession six Navy "Moth Trainers" flew in formation overhead.

Correspondence

The Editor does not hold himself responsible for opinions expressed by correspondents. The names and addresses of the writers, not necessarily for publication, must in all cases accompany letters intended for insertion in these columns.

AN "ANTI-ASTRAL" ASSOCIATION?

[2821] I thoroughly agree with you that the Dictator of Civil Aviation and his Adastral House advisers have gone much too far with their fiats, and that the time has quite come for some very plain speaking—especially in view of last Monday's fiasco discussion before the Royal and Ancient. Not only speaking, but definite action.

I feel that the Aeronautical Society has let us down. The Council chose to make the debate wide, and it must have known that that would effectively stifle any thorough criticism of the Ministry. It worked. But we are ourselves to blame for electing to the Council so many Ministry officials and others dependent on Ministry orders. We must remember this when the Ides of March bring the Council election round again.

If the Society is going to stifle free criticism it is paving the way for the formation of another "Institution"—of a completely independent nature. I would even suggest that a temporary body should get together at once to press for a drastic alteration if not a complete withdrawal of all the restrictions. It should remain in being till its aim is achieved, and re-elect its executive committee *monthly*, if it was satisfied with the amount of red-tape they had cut.

Mr. Gotch, in your issue of the 5th, pleads for cheaper and lighter aeroplanes. The machine he suggests is ruled out by the Ministry demanding 400 ft. per. min. climb. This rule has to be met if we wish to fly abroad, but there is no need for its being enforced at home. It is a mad rule: it is made in the name of safety, and it encourages fast machines and handicaps slow ones. You can get a C. of A. for a machine that staggers off at 60 m.p.h., has a climbing angle of 1 in 16 and just misses the trees, but you cannot get one if you take off with *half* the run at less than *half* the speed and have *twice* the angle of climb. The fast machine is at least ten times as dangerous and is hopeless in a forced landing, but it gets its visa and enters the Adastral Ark. *Rate* of climb is only needed in down currents, and that is a matter entirely in the hands of the user already—400 f.p.m. won't save you in a gale round Ben Nevis. It is as if the Minister of Transport said that all cars must be able to do 70 m.p.h. because it is safer in overtaking if you have good acceleration—but Heaven help the hospital staffs.

The slow machines must have more surplus power to get the climb; with 50 per cent. it will hardly do it; fast machines get a C. of A. with 30 per cent. surplus. Surplus power is a measure of the "strongness" with which a machine flies, and to that extent of its safety. So we see that the regulations encourage danger, not safety: the Adastral Ark needs a thorough spring-cleaning.

I myself pleaded with them several years ago on this matter of climb for a light machine I was building; they are still adamant, and the machine is still in abeyance.

Let us wipe out all the complex rules and substitute compulsory third-party insurance and prohibit flying over towns. Both the flying and non-flying public would benefit.

I myself would like to discuss the position with other members of the Aeronautical Society who are dissatisfied with the present state of affairs, and will make a point of being in the library at 7, Albemarle Street, all Saturday afternoon, 28th, for this purpose. I hope that many others will come so that a start can be made on thrashing the matter out.

I thank you for having brought the whole matter into prominence, and for the stand you are taking. There is truly something far wrong when FLIGHT launches a campaign.

W. E. GRAY.

Edgware.
January 23, 1933.

AN AIR MAIL ADVENTURE

[2822] I was a passenger on the Imperial Airways' African mail which left London on December 7. The Cairo-Khartoum "Argosy," *City of Glasgow*, was, as you may know, forced down on December 12 by a broken piston in the centre engine. The passengers (eight male) had to spend a day and night on the emergency landing ground in the Nubian Desert at Sherief, 80 miles north of Atbara. The female passengers (four) were accommodated in the saloons of some Sudan railway officials who happened, fortunately, to be inspecting that part of the line and who generously turned out for their benefit. The passengers removed the seat covers from the "Argosy"; these, with the assistance of a few overcoats, made passable beds, though the surface of the landing ground was not up to Croydon standard, as may be seen from the photographs. The lid of the emergency ration box made an excellent crown-and-anchor board, though the "emergency" half-bottle of cognac did not see the night through! The relief plane from Khartoum picked us up at 6.30 next morning, and we made Korti that night. The following day (the 14th) was our longest stretch, 1,015 miles, to Hampala. Owing to the fact that the wireless H.T. generator is driven by the slipstream of the middle engine propeller, we were unable to call for more than a few minutes after our landing, as the batteries ran down. Before landing, however, the W/T. operator had got off a message to say that we were forced down and would probably need a relief plane. Nevertheless, it seems a poor arrangement that failure of the middle

THE FORCED LANDING: On the left, unloading the *City of Glasgow*; on the right, looking for the cause of the trouble. Incidents referred to in E. K. Barnes' letter.

engine restricts the time that the operator has in which to make his call to the time that the pilot takes to get down, plus about 2 min. till the batteries are down. This is provided also, of course, that the forward speed of the aircraft will keep the windmill generator going without the assistance of the propeller slipstream.

Except for this incident, which the passengers all seemed to take in good part (several had never flown before), the London-Nairobi trip was extremely pleasant, the officers of Imperial Airways doing everything conceivable in their power to make the passengers comfortable. I can highly recommend to anyone going to Africa as the only real method of "seeing the country" literally.

E. KENTISH BARNES,
Mago Estate, Thika P.O., Kenya.
December 23, 1932.

AIR MAILS AND THE G.P.O.

[2823] In the article on the R.Ae.S. Debate in this week's FLIGHT, I am quoted as having said that air route control should be handed over to the G.P.O.—in other words, that control instead of being in the hands of the Air Ministry should be delegated to the Post Office.

This, however, is quite contrary to the argument which I put forward. Briefly, the argument is that if we are to differentiate civil and military aviation, economic forces alone should be allowed free play. The determining feature for private aircraft would be the terms of a compulsory insurance policy, always to be taken out and carried by the pilot, and in the case of air transport lines direct postal contracts under such conditions that the present camouflaged military civil air lines would go out of existence.

The conditions of technical control must, of course, be determined by the Air Ministry or the corresponding technical authority abroad, preferably in a very much simplified form, and by an increase in the delegation of powers. The main point of my argument is that the provision of quickened communications is a function of the Post Office in our scheme of Government, just as the payment for Transatlantic mail-carrying is made by the Post Office and not by the Board of Trade, which controls the technical conditions relating to the Mercantile Service.

Cricklewood. F. HANDLEY PAGE.
January 20, 1933.

[We are pleased to publish this correction, and in order to make the position quite clear we quote the following passages from his notes, which have been lent to us by Mr. Handley Page: "Where quick communications and their development are the basic reason for the payments, then such payments should be made by the authority which is charged with the duty of providing these communications. The Post Office is the body which, in our country, controls the State monopoly of carrying the mails. If the business community desires better communications, and the Post Office is enterprising enough to see the immense benefit which will result from an increased trade due to these quickened communications, then it is for the Post Office to provide them, even if at the beginning they result in a loss, or require a subsidy, which comes to the same thing. If continuously the cost is so great and shows no sign of abatement, and inadequate support is forthcoming from the commercial community, then and then only is the Post Office justified in considering whether Empire communications are worth while.

"The utilisation of air services for quickened communications must be considered in the same light as the utilisation of steamship lines for mails, and payment should be made by the Post Office in return for services rendered.

"If the Post Office calls for competitive tenders to carry through the work, they would gradually find that cheaper and cheaper costs would be possible, and under the pressure of economic forces alone aircraft would become more and more efficient to meet the demands of service." Ed.]

SUPERCHARGERS AT PARIS SHOW

[2824] In my article dealing with engines at the Paris Salon, which appeared in FLIGHT on December 15, in referring to supercharger development in France, I omitted, by an unfortunate oversight, to associate the mention of the Farman multi-speed blower with the name Rateau in regard to the design of the supercharger proper, the Farman Co. dealing with the multi-speed gear drive.

The name "Rateau," in the understanding of British aircraft engine constructors, is almost synonymous, as no doubt it is in France, with the terms "exhaust turbine" and "supercharger impeller." It is, therefore, the more interesting to learn that the supercharger fitted to the compression ignition engine exhibited by the Cie Lilloise de Moteurs, also mentioned in my review, is wholly designed by the Société Rateau, including the hydraulic coupling providing different speed ratios, differing entirely from the Farman mechanical variable speed drive.

Air Ministry. G. P. BULMAN.
January 16, 1933.

Airport News

FROM HESTON

CAPT. BIRKETT was busily engaged during the morning of Monday, January 9, on aerial photographic work—the day being most suitable for the purpose. After this he had a cross-country charter.

On Thursday, January 12, he was engaged by one of the evening papers to take aerial photos of the police search in Essex for Samuel Furnace. Apparently the best views were had of a fox hunt in full cry.

Mr. S. D. Wedderburn, of the Household Brigade Flying Club, carried out his first solo on Saturday, January 14.

Banco had a charter on Sunday, January 15, to Finglass (Ireland) with two passengers. Visiting machines were nine "Moths," six "Puss Moths," two "Klemms," four Autogiros, one "Bluebird," one Desoutter, one Spartan, one Pander. In addition Mr. Lowe Wylde's four *very* light aircraft came over from Hanworth and aroused much interest. There was quite a crowd of visitors, which can best be estimated by the fact that 113 lunches were served in the restaurant.

On Tuesday, January 17, Mr. Elmslie arrived from Paris in a "Puss Moth," and Mon. Le Beau left in his Farman, which had been repaired in the Service Department of Airwork, Ltd. Banco had a charter to take a press photographer as far towards Birmingham as possible, to take pictures of the snowbound country. They had not proceeded many miles before they ran into a very heavy snowstorm and were forced to return. However, the photographer managed to take some most interesting snow scenes.

On Wednesday, January 18, Mr. J. H. A. Whitehouse qualified for his "A" licence. Banco have now taken possession of the office next to Henlys, Ltd., in the Arcade at Heston Airport, and have gone to considerable trouble to provide it with every convenience and all information required by intending passengers for their excellent taxi services.

In spite of the thick fog on the morning of Thursday, January 19, the Master of Sempill left in his "Puss Moth" for Kildonan, Ireland. Owing to thick fog over Croydon the incoming air-liner from Paris (Horatius—G-AAXD) was directed by wireless to proceed to Heston, where it landed safely at 2.25 p.m. The sixteen passengers—included among them was Sir John Simon—were passed through Customs with the utmost despatch, and were then able to join Imperial Airways coach for London. With the liner able to taxi practically up to the door of the Customs office and the coach close by there was the minimum of trouble for both passengers and crew. This is a much better arrangement—especially from the passenger's point of view—than landing at Penshurst when Croydon is not available.

The hotel on the Airport is having a busy time—contrary to all expectations at this time of year. Among the guests are two young Norwegians who have bought an aeroplane and intend to fly home.

On Saturday, January 21, Mr. Hordern left for High Post aerodrome, Wiltshire, with Lady Glanesk as passenger in a "Spartan."

Mr. G. R. Wiltshire—who is on leave from Ceylon—carried out his first solo flight.

Miss Fidelia Crossley arrived from Combermere in an Avro "Cadet."

The visiting machines were: Ten "Moths," eleven "Puss Moths," two "Fox Moths," two Spartans, one "Comper Swift," one Avro Trainer, one "Percival Gull."

Two young Norwegians—Lt. Sigurd Aagnes and Wilhelm Omsted—left Heston at 7.30 a.m. on Sunday, January 22, in a "Fox Moth," G-ABZM, to fly direct to Oslo, taking the long sea crossing.

Airisms from the Four Winds

Lady Bailey's Flight

LADY BAILEY who, as was reported in last week's issue of FLIGHT, was flying to the Cape in an attempt to beat Mrs. Mollison's record, left Oran on Sunday night, January 15, to fly across the Sahara to Gao or Niamey on the Niger River. For four days nothing was heard of her, and then on Thursday evening, January 19, an official report received at the French Air Ministry stated that Lady Bailey had been found alive and well, by French airmen, 12 miles south-west of Bahua, which is some 300 miles west of the Niger River, and 1,450 miles from Oran. Lady Bailey had made good progress since she left Oran and had she not drifted so far eastward would have reached Gao or Niamey in excellent time. The French Air Ministry had gallantly issued orders that every effort was to be made to find her, and many French airmen must have spent hours flying over extremely unpleasant country, one forced landed, but it is gratifying to know that no harm came to him People at home will not realise the amount of work, and the number of hours flying, done by the French officers in the search, neither can they fully appreciate how extremely unpleasant this flying is over such country. Not for nothing have the French people a reputation for gallantry. Lady Bailey owes them much. It is reported that in future the French authorities will restrict trans-Sahara flights owing to the heavy expense incurred by searching machines in the event of forced landings, and who shall blame them?

Girl Cape Flyers Rescued

MISS JOAN PAGE and Miss Audrey Sale-Barker, who, as was reported in FLIGHT of January 19, crashed 15 miles north of Lake Magadi, have been taken to a nursing home in Nairobi, Miss Page suffering from a double compound fracture of the right leg, and bruises on the face, and Miss Barker slight concussion and a severe gash on the forehead. Apparently the machine hit a ridge of rock while a landing was being attempted on a piece of ground partially covered with mist. After the crash the two girls showed great pluck, and it was many hours before they were rescued. Miss Page was flown to Nairobi while Miss Barker followed by car.

The Prince of Wales Again in the Air

HIS ROYAL HIGHNESS, on February 1, will commence a three days' visit to his Duchy of Cornwall. He will spend one day in the Scilly Isles, flying there by seaplane.

Ye Olde Hounslowites 1919-1920

IN response to many requests, it has been suggested that an inexpensive and informal Reunion Dinner of all personnel, both sexes, connected with the birth of Civil Aviation at Hounslow Aerodrome in August, 1919, should be held in the near future, if possible at the Croydon Aerodrome Hotel. The general feeling is that it would be delightful to see many of the old faces gathered together again, irrespective of rank, talking over the good old times of converted war 'buses and conking engines, unreadable "Bolsom and Squaggy" weather reports, etc. Will all "ye olde Hounslowites" whose eyes fall on this notice and who are interested in the scheme, please, as a preliminary, drop a card to either E. H. Lawford or G. W. Thompson, at the Administration Building, Croydon Aerodrome.

Gold Rushing Up to Date

MESSRS. W. ALDRESON and A. McMartin, two Canadian mining engineers, are planning to make an air dash to the Kakamega goldfields.

French Air Scandal

MM. ANDRÉ BOUILLOUX-LAFONT and Jean de Lubersac have been sent for trial by the Paris Court of Appeal, on the charges in connection with the affairs of the Compagnie Générale Aeropostale.

The Mount Everest Flight Expedition

THE first test flight to an altitude of 24,000 ft. was carried out by the Westland P.V.3 named the *Houston-Westland* on January 23. Flown by Mr. H. J. Penrose, this height was reached within the calculated time and Air Comm. P. F. M. Fellowes, acting as observer in the rear cockpit, found the general equipment in every way satisfactory. The Bristol "Pegasus" S.3 supercharged engine functioned perfectly, while the special heating equipment and oxygen installation were found to be satisfactory. The observers' cockpit is enclosed, while sliding windows are provided for operating a cinema camera during the actual flight over the mountain. The second machine, a Westland "Wallace," is expected to be ready for its test flights shortly. Both these machines are designed so that a ceiling of 34,000 ft. will easily be obtainable and the observers' cockpit in each case is enclosed for the protection of the photographer.

A Gilbertian Story

A CZECH aeroplane recently crashed in a corner of the Austrian Alps, then after a few weeks the Austrian authorities demanded duty on an aeroplane imported into their country. The Czechs very wisely replied that a mass of broken wood and metal did not constitute an import. There followed another period of silence and the Austrians suggested a compromise, which resulted in the suggestion that if the Czechs would destroy the remains no duty would be charged. Another delay. The Czechs then agreed but when their demolition party reached the wreck they found that much pilfering had taken place, and reported it to the Austrian authorities, who thereupon retaliated by renewing the demand for duty—and they are still at it.

AD ASTRA: The Farman Stratosphere Aeroplane was "presented" at the Farman aerodrome at Toussus-le-Noble recently, and is about to make its preliminary test flights into the upper air.

The Industry

A Blackburn Review

EXPERIMENTAL work has chiefly occupied the Blackburn Aeroplane & Motor Co., Ltd., during the past year, and to a larger extent than in any previous year of the company's existence. Eight new or modified types were completed, seven of them for the Air Ministry. The company continued in their policy of specialising in the design and construction of coastal defence aircraft.

In March the "Iris V," the latest development of this type of flying-boat, completed its trials at Brough and was delivered to the R.A.F. It was fitted with three Rolls-Royce "Buzzard" engines of 825 h.p. each in place of the three "Condors" of 650 h.p. each, also cleaned up and modified, and gave a considerable improved performance over its predecessors.

A ten-passenger Civil General Purpose machine was produced, as a biplane and also as a monoplane. Both were built to the same specification for the Air Ministry, and were identical except for the wing arrangement. The engines for each were two 400 h.p. Armstrong-Siddeley "Jaguars."

Two new versions of the "Ripon" Torpedo-Bomber, used for the equipment of five Fleet Air Arm Flights, were completed, the main difference made being the replacing of the Napier "Lion" by the Bristol "Pegasus" in one case, and the Armstrong-Siddeley "Tiger" in the other.

Another new type was the Blackburn B-2 two-seat training biplane, with side-by-side seating, powered with a D.H. "Gipsy III" 120 h.p. engine. Quantity production on this has commenced. Work on the production side at Brough has not been plentiful and consequently reductions in personnel were inevitable, but the future promises greater activity on the production side. The concentration of the company's organisation at Brough by the transference of departments from the Leeds works has proceeded, and before long Brough will embrace the entire organisation.

A new contract for the training of the R.A.F. Reserve at Brough for a further period of four years was received from the Air Ministry by the North Sea Aerial & General Transport, Ltd., a subsidiary of the Blackburn company.

The "Eagle" Manual

A VERY practical instruction manual for users of the "Eagle" Aircraft Camera, Type III, is available from the manufacturers, Williamson Manufacturing Co., Ltd., Litchfield Gardens, Willesden Green, N.W.10. It is a complete guide to the necessarily intricate mechanism of the camera, and enables the operator to use it satisfactorily with the minimum of technical knowledge. Several diagrams add to the instructional value of the manual.

A D.H. Publication

A BROCHURE issued by the De Havilland Aircraft Co. Ltd., contains a comprehensive survey of the company's history, descriptions of the types of aircraft and engines produced, the extensive service organisation maintained, and details of the D.H. School of Flying and the Aeronautical Technical School. From the manufacture of aircraft and engines to the facilities offered for practical and theoretical training is a range of activity emphasising what a complete organisation is the D.H. company. The astuteness of the firm's commercial policy has not only meant a world-wide market for their products, but has also been a splendid advertisement for British commercial aircraft generally. Amongst the interesting facts which arrest one's attention in perusing the brochure are that "Moths," "Puss Moths," "Fox Moths" and "Tiger Moths" have been sold in fifty-three countries, and that the "Moth" has been supplied for training purposes to the Air Forces of Canada, Australia, S. Africa, Irish Free State, New Zealand, Chile, Italy, Denmark, Greece, Spain, Portugal, Yugo Slavia, Roumania and Norway, as well, of course, to the Royal Air Force. D.H. aircraft are manufactured abroad in Canada, S. Africa, Australia, India, France, Finland and Norway. A useful inset with the brochure is a pamphlet containing a list of successes attained with various D.H. aircraft.

Petro-Flex Agents

THE Petro-Flex Tubing Co., Ltd., of Watford, Herts, announce that their agreement with Messrs. Hobdell, Way & Co., Ltd., who have acted for many years as their selling agents for all their products, has now been terminated, and the agency has been taken over by S. Smith & Sons (Motor Accessories), Ltd., to whom all future inquiries should be addressed.

Hoffman Catalogue

A NEW edition of their catalogue on self-aligning ball and roller bearings has been issued by the Hoffman Manufacturing Co., Ltd., of Chelmsford. It includes a larger selection of the double row bearings, which are largely used in applications where a simple form of self-aligning unit is required. Listed with them is a taper sleeve and nut in light and medium series, also in light and medium series of a wide pattern, which finds favour with many designers. A copy of the new catalogue will be sent on application to the company.

"Chocolate Drops"

THE aerial delivery service inaugurated by J. S. Fry & Sons last September is to be speeded up by the use of parachutes. "We propose on certain journeys of the air van, to drop chocolate and cocoa at intermediate points," said an official of the firm. "The great asset of the service is its speed, but the saving in time is partly lost, even on long journeys, if the machine has to stop to deliver goods at several aerodromes *en route*. In the case of a flight, for example, from the aerodrome at our factory at Somerdale to Scotland, the parachutes might be dropped at Birmingham, Leeds and Manchester or Newcastle. The parachutes will be similar to those used by the R.A.F. for dropping supplies on isolated bases in the East. We hope to inaugurate the new service within the next few weeks." The air delivery van, a "Puss Moth," has been called into service many times to rush deliveries to retailers all over the country.

AN AERIAL SIGNPOST: Mr. Wallace Barr, Managing Director of Cellon, Ltd., believes in assisting all pilots to the best of his ability, and this is one of the many ways in which he does so. His factory, opposite that of Leyland Motors, Ltd., has the roof all painted in a light colour, and is a distinctive landmark.

THE ROYAL AIR FORCE

London Gazette, January 17, 1933.

General Duties Branch

The follg. are granted short service commns, as Acting Pilot Officers on probation with effect from and with seny. of January 6 :—F. E. H. Cooper, H. M. Cox, R. J. F. Craig, G. W. Golledge, W. M. Graham, N. W. D. Marwood-Elton, B. J. Paul, A. Ross, A. G. Strutt, H. C. S. Vetch, C. H. D. Wardrop, C. F. C. Wright. The follg. are granted short service commns. as Acting Pilot Officers on probation with effect from the dates shown and with seny. of January 6 :—F. D. Nugent (January 9), E. H. Wheelwright (January 10).

Group Capt. D. C. S. Evill, D.S.C., A.F.C., is placed on half-pay list, Scale A, from December 10, 1932, to January 2, inclusive ; Group Capt. G. R. M. Reid, D.S.O., M.C., is placed on half-pay list, Scale A, from January 4 to January 8, inclusive ; Wing Comdr. F. J. Linnell, O.B.E., is placed on half-pay list, Scale A, from January 8 to January 15, inclusive ; Lt. G. M. Pares, R.N., Flying Officer, R.A.F., ceases to be attached to R.A.F. on return to Naval duty (January 10). The follg. are placed on retired list (January 15) :—Flight Lt. F. W. Boggis, Flight Lt. B. T. Crook, Flying Officer W. J. Coadwell, D.S.M.

Flying Officer E. N. V. Everett is transferred to Reserve, Class A (January 13) ; Flight Lt. F. W. Moxham is transferred to Reserve, Class C (January 14). The short service commn. of Pilot Officer on probation R. J. R. Docker is terminated on cessation of duty (January 8).

Stores Branch

The follg. are granted permanent commns. as Pilot Officers on probation with effect from and with seny. of January 6 :—D. Stephenson, D. F. Syder, C. H. E. Lyster, E. J. Smith, R. C. V. Ash.

Accountant Branch

Flight Lt. R. W. L. Glenn takes rank and precedence as if his appointment as Flight Lt. bore date January 1, 1931, immediately preceding Flight Lt. H. J. Titherington on the gradation list. Reduction takes effect from December 14, 1932.

Memorandum

No. 14334 Flight Cadet S. G. Treasure is granted an honorary commn. as Sec. Lt. with effect from date of demobilization.

PRINCESS MARY'S ROYAL AIR FORCE NURSING SERVICE

The follg. Staff Nurses are appointed to the permanent service (January 1) : —Miss M. R. Gall ; Miss E. M. Tilbrook ; Miss A. K. Macfie.

ROYAL AIR FORCE RESERVE
RESERVE OF AIR FORCE OFFICERS

General Duties Branch

F. G. Saunders, M.C., is granted a commn. in Class C as a Flight Lt. (January 18). The follg. Flying Officers relinquish their commns. on completion of service :—L. C. Burcher (December 16, 1932) ; H. R. Vaughan Fowler (December 29, 1932) ; T. H. Finney (January 14) ; G. W. P. Irwin (January 14).

Flying Officer R. J. Copley relinquishes his commn. on completion of service and is permitted to retain his rank (December 19, 1930). (Substituted for *Gazette* March 24, 1931.)

Medical Branch

Flight Lt. E. A. Aslett is transferred from Class D (ii.) to Class D (i.) (December 1, 1932).

Special Reserve

J. L. C. Newton is granted a commn. as Pilot Officer on probation (December 17, 1932).

ROYAL AIR FORCE INTELLIGENCE

Appointments.—The following appointments in the Royal Air Force are notified :—

General Duties Branch

Group Captain A. C. Wright, A.F.C., to H.Q., Air Defence of Gt. Britain, Uxbridge, 10.1.33, on appointment as Officer-in-Charge, Administration, *vice* Air Commodore F. K. Haskins, D.S.C.

Wing Commanders : E. R. Vaisey, to No. 23 Group, H.Q., Grantham, 4.1.33, for Engineer Staff duties *vice* Wing Com. R. H. Kershaw. E. O. Grenfell, M.C., D.F.C., A.F.C., to Station H.Q., Biggin Hill, 8.1.33, to command, *vice* Wing Com. G. B. Dacre, D.S.O.

Squadron Leaders : O. W. de Purton, to H.Q., Air Defence of Gt. Britain, Uxbridge, 5.1.33, for Personnel Staff duties. W. A. K. Dalzell, to Station Flight, Abingdon, 9.1.33, for Flying (Flying Instr.) duties, *vice* Sqd. Ldr. F. J. W. Mellersh, A.F.C. J. H. O. Jones, to No. 209 (F.B.) Sqdn., Mount Batten, 6.1.33, for Flying duties. W. R. D. Acland, D.F.C., A.F.C., to R.A.F. Staff College, Andover, 5.1.33, for duty as Instructor. G. S. N. Johnston, to Air Ministry, Dept. of Chief of the Air Staff, (D.O.I.), 5.1.33, for Air Staff duties, *vice* Sqd.-Ldr. W. R. D. Acland, D.F.C., A.F.C.

Flight Lieutenants : E. T. Carpenter, A.F.C., to Station H.Q., Tangmere, 2.1.33. E. P. M. Davis, A.F.C., A.M., to H.Q., Coastal Area, Lee-on-Solent, 12.12.32. F. G. H. Ewens, to R.A.F. College, Cranwell, 2.1.33. P. W. Lowe-Holmes, to No. 1 Air Defence Group, H.Q., 9.1.33. J. S. Nichol, to H.M.S. *Glorious*, 3.1.33. H. A. Haines, D.F.C., to School of Army Co-operation, Old Sarum, 9.1.33. J. L. M. de C. Hughes-Chamberlain, to No. 33 (B.) Sqdn., Bicester, 9.1.33. B. A. S. Lewin, to Station H.Q., Mount Batten, 9.1.33. G. E. Nicholetts, A.F.C., to H.Q., R.A.F., Cranwell, 7.1.33. J. I. Wingate, to H.Q., Wessex Bombing Area, Andover, 9.1.33. C. A. Bell, to Elec. & Wireless School, Cranwell, 29.12.32. E. C. T. Edwards, to No. 25 (F.) Sqdn., Hawkinge, 5.1.33. G. P. H. Carter, to No. 12 (B.) Sqdn., Andover, 10.1.33.

Stores Branch

Flight Lieutenant L. L. Bray, to No. 22 Group H.Q., S. Farnborough, 10.1.33.

Accountant Branch

Flying Officer H. Crowther, to R.A.F. Storage Section, Kenley, 9.12.32.

Medical Branch

Flight Lieutenant R. G. Freeman, to Station H.Q., North Weald, 10.1.33.

Flying Officers : R. E. W. Fisher, to No. 5 Flying Training School, Sealand, 7.1.33. J. F. Sandow, to Central Flying School, Wittering, 7.1.33.

Dental Branch

Flying Officer C. R. Stone, to R.A.F. Training Base, Leuchars, 11.1.33.

Chaplains Branch

Rev. K. C. H. Warner, D.S.O., to H.Q., R.A.F., Cranwell, 10.1.33, for duty as Chaplain (Church of England).

NAVAL APPOINTMENTS

The following appointments have been made by the Admiralty :—

Lieut.-Commrs.—A. B. Usher, to *Victory*, for R.A.F. Base, Gosport (Jan. 30) ; F. M. R. Stephenson (Flt. Lt., R.A.F.), to *Victory*, for R.A.F. Base, Gosport, for course (Feb. 1) ; and to *Victory*, for School of Naval Co-operation, Lee-on-Solent, and for 444 Flt., in command (Feb. 8) ; E. K. H. St. Aubyn and E. F. Disbrowe, to *Vindictive* (Jan. 25 and Feb. 1, respectively) ; E. M. Evans-Lombe, to *Pembroke* (Jan. 23) ; and A. C. Cresswell, to *Despatch* (Jan. 25).

Lieuts. (F/O., R.A.F.).—G. D. Anderson, to *Victory*, for R.A.F. Base, Gosport (Dec. 28). N. S. Luard, to *Victory*, for R.A.F. Base, Gosport, and for B.T.S. ; and M. Bruce, to *Victory*, for R.A.F. Stn., Netheravon, and for 405 Flight (Jan. 16).

ROYAL AIR FORCE

Squadron Leader.—H. V. Drew, O.B.E., A.F.C., to *Courageous* (Dec. 28).

Flight Lieutenant.—J. S. Nichol, to *Glorious* (Jan. 3).

Flying Officer.—W. V. L. Spendlove, to *Furious*, for 401 Flight (Jan. 1).

Flying Officers, R.A.F.—H. A. Simmons, to III (F.) Sqdn. (Jan. 1) ; F. S. Gardner, to *Furious*, for 401 Flight ; W. H. Kyle, to *Courageous*, for 450 Flight ; and K. N. Sayers, to *Furious*, for 449 Flight (Jan. 2).

Cranwell College

THE Air Ministry announces : Aircraft Apprentices L. C. Bicknell, H. C. Vickery, A. J. Whillier and L. Rose from No. 1 School of Technical Training (Apprentices), Halton, have been selected for cadetships at the Royal Air Force College, Cranwell, on the result of the examinations held on completion of their three years' training as aircraft apprentices.

Flt. Cadet L. C. Bicknell comes from Stockton, Rugby, Warwickshire ; Flt. Cadet H. C. Vickery from Brompton, Chatham, Kent ; Flt. Cadet A. J. Whillier from Newport, Isle of Wight, and Flt. Cadet L. Rose from Chelmsford, Essex.

The " Lord Wakefield " Scholarships valued at £75 each have been awarded to Flight Cadets L. C. Bicknell and H. C. Vickery.

Status of R.A.F. Warrant Officers

WARRANT officers are being given increased responsibilities in connection with technical duties and administration. At the same time the Air Council have had under consideration the most appropriate methods of raising the formal status of warrant officers to accord with the additional responsibilities assumed. It has not been overlooked that the main recognition of higher status rests in the increased responsibilities themselves, but the Air Council are of opinion that these should also be recognised by certain definite improvements in conditions of service.

After careful consideration, the Air Council have decided to make the undermentioned changes regarding the status and responsibilities of warrant officers.

Title.—The rank of sergeant-major is abolished and that of warrant officer substituted therefor. They will be referred to as " Mr." and will on all occasions be addressed by airmen as " Sir," as is customary at present.

Disciplinary.—The trial of warrant officers by district court-martial will cease, and, in future, they will be liable to trial only by general court-martial or field general court-martial, or summarily under section 47 of the Air Force Act.

Responsibilities.—When acting as orderly officer, they will carry out full duties of that post in connection with : (*a*) Daily inspection of detention rooms (*b*) Daily mustering and examination of secret and confidential publications issued to, and retained by, signal and W/T offices. (*c*) Receipt, etc., of registered mail.

They will be shown such secret publications as their duties require.

Dress.—The design of the greatcoat is being revised ; it will be made longer, and have belt and shoulder straps.

Leave.—Subject to the exigencies of the service, the amount of leave that may be granted to them at home and abroad will be increased to 56 days per annum, with effect from 1st April, 1933.

Miscellaneous.—Warrant officers will be paid separately by the accountant officer instead of attending ordinary pay parade. The names of warrant officers will be shown by units in the Air Force List. They will be eligible to serve as members of Fire Committees. In future building schemes, warrant officers' quarters will be separated from those of airmen whenever possible. In future, an annual confidential report will be required in respect of every warrant officer.

Courses of Instruction in Metal Rigging

Two courses of instruction for carpenters, rigger, and riggers, aero, in metal rigging have been instituted at the School of Technical Training (Men), Manston. (i) A short course of 16 weeks' duration. (ii) A continuation course, also of 16 weeks' duration.

The short course is intended to teach airmen the foundations of metal rigging and to enable them to carry out with confidence repairs to metal aircraft under fully skilled supervision. With the practical knowledge they will gain by working in their units after completing the short course, it is anticipated that they will be able in a short time to pass the examination for remustering to metal rigger.

The purpose of the continuation course is to afford to airmen, who are unable to remuster after the short course, an opportunity to remuster to metal rigger.

AIRCRAFT COMPANIES' STOCKS AND SHARES

ALTHOUGH at the time of writing business in the stock and share markets has experienced a contraction and rather lower prices are being sent out, leading industrial shares show a good upward movement on balance for the month. The latest development in connection with the War Debts question and hopes attaching to the forthcoming World Economic Conference are influencing sentiment favourably. Shares of companies operating in the aircraft and allied industries have reflected the upward movement shown by markets during the month. For instance, Rolls-Royce are 48s., as compared with 46s. 3d. a month ago, attention having been drawn to the shares by the news of the order received by the company from the Netherlands Government for "Kestrel" aero engines. In the market it is hoped that the dividend will again be 10 per cent. and that the company has had a very satisfactory year. The annual report is usually published in March. Fairey Aviation, which have been steady, are unchanged on balance for the month at 17s. 6d. In this case the further order received from the Belgian Government and the more general realisation of the company's good financial position have been favourable influences. De Havilland show an improvement from 15s. 6d. to 17s., and Handley Page preference are also better at 7s. 3d., compared with 6s. 10½d. a month ago. D. Napier are slightly higher at 4s. and the 7½ per cent. preference have been marked up from 18s. 9d. to 21s. 3d., but the 8 per cent. non-cumulative preference are unchanged at 12s. 6d. The market does not apparently anticipate that the report, due in March, will announce the resumption of dividends on the last named, for it is possible the directors will continue to conserve resources. As the dividend on these preference shares is not cumulative, there will be no arrears to clear off when it is decided to resume dividends on the ordinary. At the time of writing business has not been marked this month in National Flying Services. There has been a good move upward in Armstrong-Siddeley Development preference. In other directions there was a further rise in Joseph Lucas and in the preferred ordinary shares of S. Smith (M.A.), another accessory manufacturing company. Brown Brothers moved up to 32s. 6d., presumably on the possibility of a larger dividend; 17 per cent. could have been paid last year if profits had been fully distributed. Dunlop Rubber issues have been active accompanied by the view current in the market that the company may be earning a small dividend on its ordinary units.

Name	Class	Nominal Amount of Share	Last Annual Dividend	Current Week's Quotation
		%		
Anglo-American Oil	Deb.	Stk.	5½	101
Armstrong-Siddeley Develop...	Cum. Pref.	£1	6½	21/3
Birmingham Aluminium Castg.	Ord.	£1	5	18/7½
Booth (James), 1915	Ord.	£1	15	58/9
Do. do.	Cum. Pref.	£1	7	26/6
British Aluminium	Ord.	£1	5	24/–
Do. do.	Cum. Pref.	£1	6	21/10½
British Celanese	Ord.	10/–	Nil	7/–
British Oxygen	Ord.	£1	3	28/1½
Do. do.	Cum. Pref.	£1	6½	25/7½
British Piston Ring	Ord.	£1	12½	30/–
British Thomson-Houston ..	Cum. Pref.	£1	7	28/–
Brown Brothers	Ord.	£1	10	32/6
Do. do.	Cum. Pref.	£1	7½	26/3
Dick (W. B.)	Cum. Pref.	£10	5	122/6
De Havilland Aircraft	Ord.	£1	2½	17/–
Dunlop Rubber	Ord.	c	Nil	21/–
Do. do.	"C" Cum. Pref.	16/–	10	21/3
En-Tout-Cas (Syston)	Def. Ord.	1/–	Nil	–/6
Do. do.	Ptg. Pfd. Ord.	5/–	8	2/6
Fairey Aviation	Ord.	10/–	10*	17/6
Do. do.	1st Mt. Deb.	Stk.	8	110
Firth (T.) & John Brown ..	Cum. Pref.	£1	6D	5/6
Do. do.	Cum. Pref.	£1	5*D	5/6
Ford Motor (England)	Ord.	£1	Nil	20/–
Fox (Samuel)	Mt. Deb.	Stk.	5	84½
Goodyear Tyre and Rubber ..	Deb.	Stk.	6½	104
Handley Page	Ptg. Pref.	8/–	10B	7/3
Hoffmann Manufacturing ..	Ord.	£1	Nil	15/6
Do. do.	Cum. Pref.	£1	7½	21/3
Imperial Airways	Ord.	£1	3	23/3
Kayser, Ellison	Ord.	£5	Nil	50/–
Do. do.	Cum. Pref.	£5	6	70/–
Lucas (Joseph)	Ord.	£1	20	79/6
Napier (D.), & Son	Ord.	5/–	Nil	4/–
Do. do.	Cum. Pref.	£1	7½	21/3
Do. do.	Pref.	£1	8A	12/6
National Flying Services ..	Ord.	2/–	Nil	–/4½
Petters	Ord.	£1	Nil	11/3
Do.	Cum. Pref.	£1	7½	10/–
Roe (A. V.), (Cont. by Armstrong-Siddeley Devel, *q.v.*) ..	Ord.	£1	—	—
Rolls-Royce	Ord.	£1	10	48/–
Smith (S.) & Sons (M.A.) ..	Def. Ord.	1/–	Nil	3/3
Do. do.	Pt. Ptd. Ord.	£1	7	31/3
Do. do.	Cum. Pref.	£1	7½	22/6
Serck Radiators	Ord.	£1	12½	29/6
"Shell" Transport & Trading	Ord.	£1	7½*	47/6
Do. do.	Cum. Pref.	£10	5	£10⅝
Triplex Safety Glass	Ord.	10/–	10E	32/9
Vickers	Ord.	6/8	5	7/–
Do.	Cum. Pref.	£1	5*	19/10½
Vickers Aviation (Cont. by Vickers, *q.v.*)	—	—	—	—
Westland Aircraft (Branch of Petters, *q.v.*)	—	—	—	—

* Dividend paid, tax free. c £1 unit of stock. D Last xd. March, 1931. A Last xd. September, 1931. B Last xd. July, 1932. E On shares of £1 denomination.

"Luxor" Goggles Contract

FOR the third year the Dutch Government has placed a contract for No. 10 Luxor Goggles with the manufacturers, E. B. Meyrowitz, Ltd., 1A, Old Bond Street, W.1.

"Handi"-Spray Plant

A PORTABLE spray-paint plant of small dimensions has been placed on the market by B. E. N. Patents, Ltd., of 92, Tottenham Court Road, W.1. The outfit comprises a single-cylinder air-cooled compressor, a ¼-h.p. electric motor, spray-paint gun with container, and an oil and water separator with pressure gauge and relief valve. It is mounted on a light rigid steel base carried on four rubber buffers. All classes of lacquers and paints can be sprayed with this outfit, and a simple change of the head of the gun converts it for full-size production work.

PUBLICATIONS RECEIVED

Fly With Me.—By Capt. H. Duncan Davis, A.F.C., and C. Spriggs. London: John Hamilton, Ltd. Price 5s.

Christchurch Magnetic Observatory Annual Reports for 1928, 1929, 1930. N.Z. Department of Scientific and Industrial Research. Government Printing Office, Wellington, New Zealand.

Polemica Aeronautica. Guerra Aerea e Guerra Terrestre. Stanislao Sereno. *Guerra Aerea e Guerra Terrestre.* Victor. *L'Aeronautica in Guerra.* Dott. G. Landi. *L'Impiego dei Mezzi Aerei nel Conflitto da Shanghai.* Commandante Fugo. "Rivista Aeronautica," Rome.

Beyond Control. By Rex Beach. London: Hutchinson and Co., Ltd. Price 7s. 6d.

Brassey's Naval and Shipping Annual, 1933. London: Wm. Clowes and Sons, Ltd. Price 25s. net.

Efficient Oil Cleaning. British Oil Cleaners, Ltd., 66, Upper Richmond Road, London, S.W.15.

NEW COMPANIES REGISTERED

SYWELL AERODROME, LTD.—Capital £1,500 in £1 shares. Formed to acquire, provide and maintain aerodromes, garages, hangars, sheds, landing grounds, etc. The subscribers (each with one share) are: Baron Willoughby de Broke, Woodley House, Kineton, Warwick; John T. P. Jeyes, Holly Lodge, Broughton, Northants, chemist. Secretary C. Newton. Solicitor: Arthur E. Ray, 18, Market Square, Northampton.

WHITEHALL & FOREIGN AGENCIES, LTD., Quadrant House, 55-6, Pall Mall, S.W.1.—Capital £100 in 10s. shares. The objects are to act as agents, and particularly in connection with the sale, purchase, hire, manufacture, supply or transport of any property, armaments, munitions, ships, aircraft, etc. Directors: Sir Henry White-Smith, C.B.E., 17, Ennismore Gardens, S.W.1 (director International Television Corporation, Ltd.), and Murray G. Baillie, 16, Kensington Square, W.8 (director Waterloo Investment Trust, Ltd.).

AERONAUTICAL PATENT SPECIFICATIONS

Abbreviations: Cyl. = cylinder; i.c. = internal combustion; m. = motors.

(The numbers in brackets are those under which the Specification will be printed and abridged, etc.)

APPLIED FOR IN 1931

Published January 19, 1933

17,252. VICKERS-ARMSTRONGS, LTD., J. P. WATSON and S. PARKER. Apparatus for use in the fire control of anti-aircraft guns. (385,300.)

17,590. NAAMLOOZE VENNOOTSCHAP PHILLIPS' GLOEILAMPENFABRIEKEN. Luminous signal devices adapted for air-traffic. (385,325.)

27,207. AVIONS H.M.D. FARMAN. Supercharging of i.c. aircraft engines. (385,373.)

32,152. A. G. C. A. RAWSON. Aircraft with freely-rotative wings. (385,408.)

35,464. WRIGHT AERONAUTICAL CORPN. Pistons. (385,426.)

Published January 26, 1933

27,209. ARMSTRONG SIDDELEY MOTORS, LTD., and F. M. GREEN. Cowlings for air-cooled i.c. engines. (385,681.)

33,159. BRAITHWAITE & CO. ENGINEERS, LTD., and J. C. HINES. Manufacture of aerodromes and means therefor. (385,718.)

APPLIED FOR IN 1932

Published January 19, 1933

7,951. B. D. BATE. Protection of aircraft in case of accident and theft. (385,487.)

11,246. IMPERIAL AIRWAYS, LTD., HUMPHREY, G. E. WOODS and H. L. HALL. Sparking-plugs for i.c. engines. (385,505.)

Published January 26, 1933

6,328. D. R. CAMPENS. Helicopters. (385,789.)